OpenRG User Manual

Version 5.3

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JUNGO®
Smarter Gateways

OpenRG
User Manual

Version 5.3

Jungo Software Technologies Ltd.

OpenRG
User Manual: Version 5.3

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This document is available for download at: *http://www.jungo.com/openrg/documentation.html*, *version 5.3*

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Table of Contents

I. Managing Your Gateway 1
1. Accessing the Management Console 3
2. Home 6
2.1. Overviewing Your Gateway 6
2.1.1. Viewing and Connecting to Your Broadcasted Wireless Network..... 7
2.1.2. Viewing the Local Network 9
2.1.3. Authenticating Wireless Network Devices 10
2.1.4. Viewing Attached Devices 11
2.1.5. Viewing the System Status 12
2.2. Viewing Your Network with Map View 12
2.3. Installation Wizard 14
2.3.1. Step 1: Test Ethernet Link 15
2.3.2. Step 2: Analyze Internet Connection Type 16
2.3.3. Step 3: Setup Internet Connection 17
2.3.4. Step 4: Test Service Provider Connection 18
2.3.5. Step 5: Test Internet Connection 18
2.3.6. Step 6: Wireless Setup 18
2.3.7. Step 10: Installation Completed 20
2.4. Configuring Your Wireless Connection 21
3. Internet Connection 28
3.1. Viewing Your Internet Connection Properties 28
3.2. Configuring Your Internet Connection 29
4. Services 31
4.1. Overviewing Your Services 31
4.2. Securing Your Network with the Firewall 32
4.2.1. Configuring Basic Security Settings 32
4.2.2. Controlling Access to Internet Services 35
4.2.3. Using Port Forwarding 38
4.2.4. Using Port Triggering 41
4.2.5. Restricting Web Access 44
4.2.6. Using OpenRG's Network Address and Port Translation 47
4.3. Managing Your Bandwidth with Quality of Service 56
4.3.1. Selecting a QoS Profile 58
4.3.2. Viewing Your Bandwidth Utilization 60
4.3.3. Defining Traffic Priority Rules 62
4.3.4. Avoiding Congestion with Traffic Shaping 67
4.3.5. Prioritizing Traffic with DSCP 73
4.3.6. Configuring 802.1p Priority Values 74
4.3.7. Viewing Traffic Statistics 75
4.3.8. Example: Providing Priority to a Voice Stream 76
4.3.9. Example: Providing Priority to an IPTV Stream 85
4.4. Sharing Your Media with the Home Network 96
4.4.1. Configuring the Media Sharing Service 96
4.4.2. Streaming Your Media to a TV via a Media Client Device 98
4.4.3. Accessing the Shared Media from a LAN Computer 102
4.5. Utilizing Telephony on Your Gateway 107

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4.5.1. Configuring Your Telephone Line Services 107
4.5.2. Operating Your Telephone 109
4.5.3. Configuring and Using Speed Dial 110
4.5.4. Sending a Fax 112
4.5.5. Customizing Your Phone Service with a Numbering Plan 113
4.5.6. Using Distinctive Ring 115
4.5.7. Ensuring Constant Connectivity with Failover 115
4.5.8. Advanced Telephony Options 116
4.6. IP-PBX 126
4.6.1. Configuring Your Analog Extensions 127
4.6.2. Operating Your Telephone 128
4.6.3. Connecting VoIP Telephones 130
4.6.4. Opening Telephony Service Accounts 134
4.6.5. Defining VoIP Lines 134
4.6.6. Creating Auto Attendants 139
4.6.7. Handling Incoming Calls 142
4.6.8. Handling Outgoing Calls 145
4.6.9. Using the Voice Mail 148
4.6.10. Adding On-Hold Music Files 150
4.6.11. Automating Call Distribution with Hunt Groups 151
4.6.12. Advanced Telephony Options 154
4.7. Managing Your Shared Storage 165
4.7.1. Managing Your File Server 166
4.7.2. Managing Your Disks 174
4.8. Accessing Your Network Using a Domain Name 186
4.8.1. Opening a Dynamic DNS Account 186
4.9. Configuring Your Gateway's IP Address Distribution 188
4.9.1. Viewing and Configuring the DHCP Settings 189
4.9.2. DHCP Connections 191
4.10. Parental Control 192
4.10.1. Overview 193
4.10.2. Filtering Policy 194
4.10.3. Advanced Options 196
4.10.4. Statistics 197
4.11. Virtual Private Network 198
4.11.1. Internet Protocol Security 198
4.11.2. Secure Socket Layer VPN 236
4.11.3. Point-to-Point Tunneling Protocol Server 253
4.11.4. Layer 2 Tunneling Protocol Server 254
4.12. Bluetooth Settings 258
5. System 260
5.1. Viewing the System Information 260
5.2. Setting the Date and Time 260
5.3. Managing Users 263
5.3.1. Adding a User 264
5.3.2. Disk Management 265
5.3.3. E-Mail Notification 265
5.3.4. Group Settings 266

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5.3.5. Editing a User's Profile 266
5.4. Performing Advanced Management Operations 267
5.4.1. Utilizing OpenRG's Universal Plug and Play Capabilities 267
5.4.2. Simple Network Management Protocol 271
5.4.3. Enabling Remote Administration 274
5.5. Performing System Maintenance 277
5.5.1. About OpenRG 277
5.5.2. Rebooting Your Gateway 277
5.5.3. Restoring Factory Settings 278
5.5.4. Upgrading the Gateway's Firmware 278
5.5.5. Replacing OpenRG's MAC Address 282
5.6. Creating and Loading Digital Certificates 282
5.6.1. Overview 282
5.6.2. OpenRG Certificate Stores 284
II. Appendix 296
6. Configuring a Computer's Network Interface 298
7. Licensing Acknowledgement and Source Code Offering 300
8. Contact Jungo 301

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Part I Managing Your Gateway

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Table of Contents

1. Accessing the Management Console 3
2. Home 6
3. Internet Connection 28
4. Services 31
5. System 260

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1

Accessing the Management Console

This chapter describes how to use OpenRG's management console, referred to as the **Web-based Management (WBM)**, which allows you to configure and control all of OpenRG's features and system parameters, using a user-friendly graphical interface. This user-friendly approach is also implemented in the WBM's documentation structure, which is based directly on the WBM's structure. You will find it easy to correspondingly navigate through both the WBM and its documentation.

Note: Access to the WBM is restricted to wired clients and Web-authenticated or secured wireless clients. In addition, some of the documented WBM features may appear slightly different or may not be available on certain platforms.

To access the Web-based management:

1. Launch a Web browser on a computer in the LAN.
2. In the address bar, type the gateway's name or IP address. The default name is 'http://openrg.home' and the default IP address is 192.168.1.1. The WBM's homepage appears.

By default, OpenRG's WBM is displayed in read-only basic mode, providing you with the ability to view your features and system parameters. This mode prevents accessing and changing the gateway's settings, misconfiguration of which may harm its performance.

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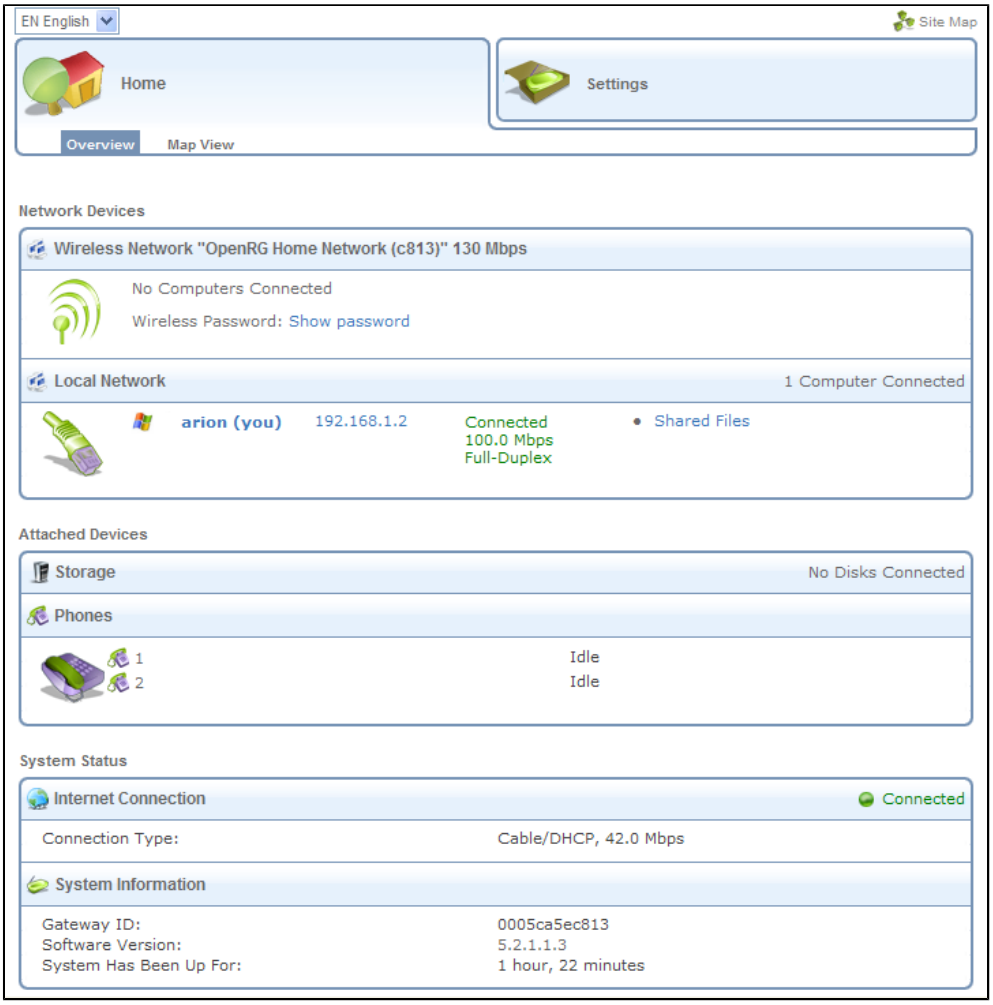

Figure 1.1 WBM – Read Only Basic Mode

To perform configuration actions on your gateway, click the 'Settings' tab. You are required to log in.

Figure 1.2 Settings Login

Enter your username and password, and click 'Continue'. The default username is 'home' and the default password is 'home'.

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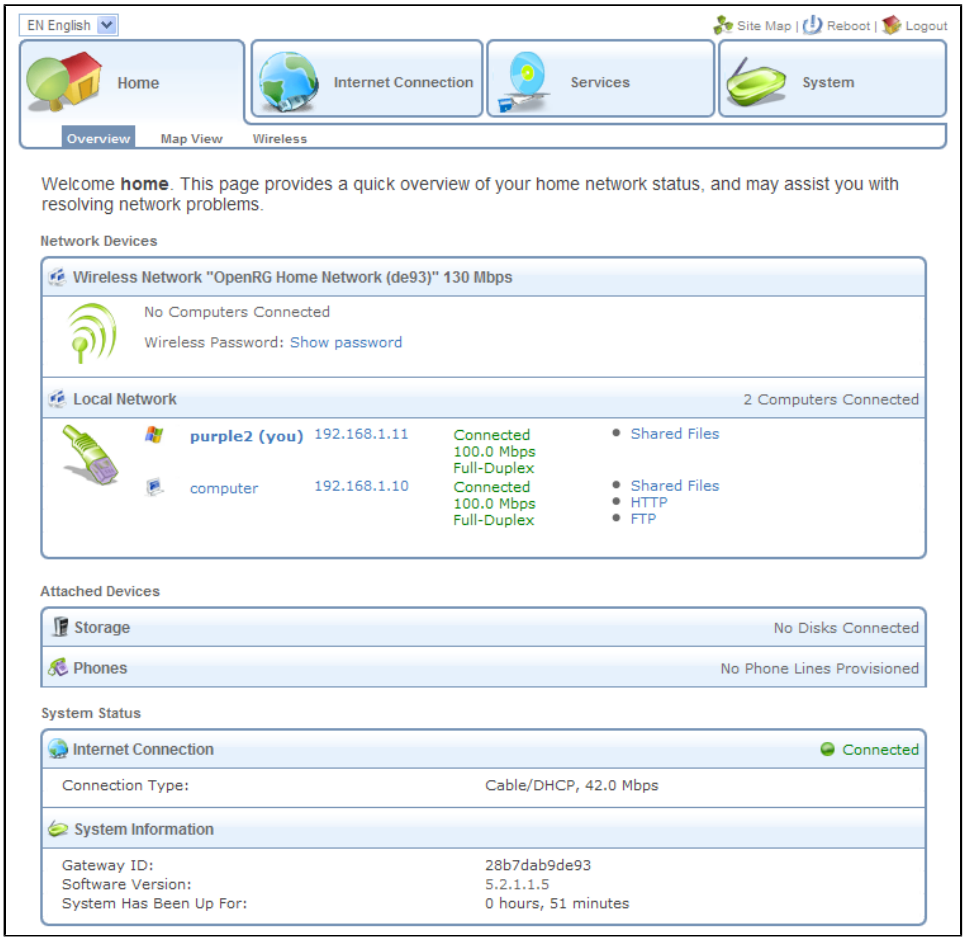

Figure 1.3 WBM – Configuration Mode

By logging in, you have switched from read-only mode to configuration mode. You can now perform various configurations of your gateway, as described in the following sections. To return to read-only mode, click the 'Logout' link located on the top bar.

Warning: Misconfiguration of the gateway may harm its performance. Therefore, it is highly recommended that you refrain from accessing the advanced configuration mode, unless you have strong technical knowledge of the gateway's advanced features.

A login session will automatically time-out after an extended period of inactivity. If you try to operate the WBM after the session has expired, the 'Login' screen will appear. This feature helps to prevent unauthorized users from accessing your session and changing the gateway's settings.

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2

Home

2.1 Overviewing Your Gateway

The 'Overview' screen presents the status of OpenRG's various modules in one convenient location. You can quickly and efficiently view important system details such as the status of your Internet connection, wireless and local networks, as well as hardware peripherals.

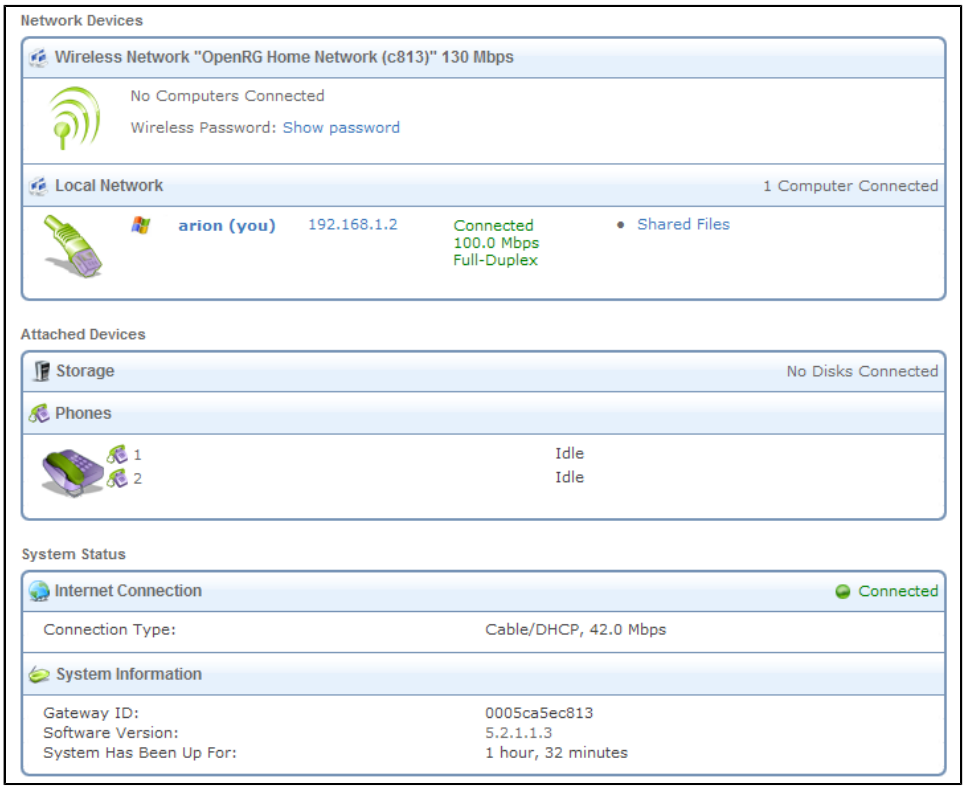

Figure 2.1 Home – Overview

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2.1.1 Viewing and Connecting to Your Broadcasted Wireless Network

The 'Network Devices' section displays OpenRG's broadcasted wireless network. To connect to this network from a wireless Windows computer, perform the following:

1. In the Windows system tray, click the wireless connection icon.

Figure 2.2 Wireless Icon in the System Tray

The 'Wireless Network Connection' screen appears, displaying all available wireless networks (also known as Wi-Fi hotspots) in your vicinity. If your gateway is connected and active, you should see its wireless network displayed in this screen. The default wireless network name (SSID) is "OpenRG Home Network (XXXX)", where XXXX are the last four characters of the gateway's **CM MAC** address (as printed on the sticker located at the bottom of the gateway).

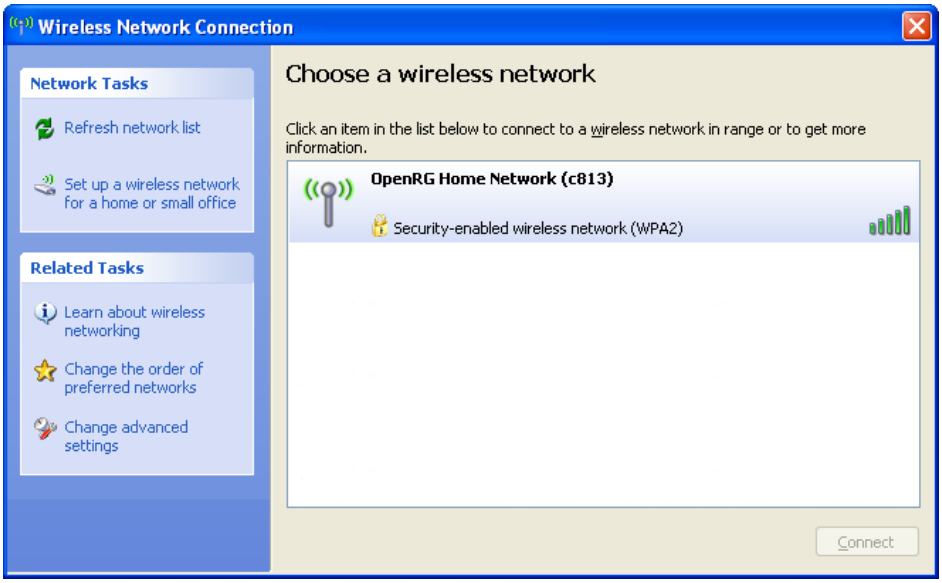
Wireless Network Connection
Network Tasks
Refresh network list
Set up a wireless network for a home or small office
Related Tasks
Learn about wireless networking
Change the order of preferred networks
Change advanced settings
Choose a wireless network
Click an item in the list below to connect to a wireless network in range or to get more information.
OpenRG Home Network (c813)
Security-enabled wireless network (WPA2)
Connect

Figure 2.3 Available Wireless Connections

If you do not see your network, refresh the list of detected networks using the 'Refresh network list' link.

2. Select the connection and click the 'Connect' button at the bottom of the screen. The following window appears, requiring you to provide the WPA password (network key).

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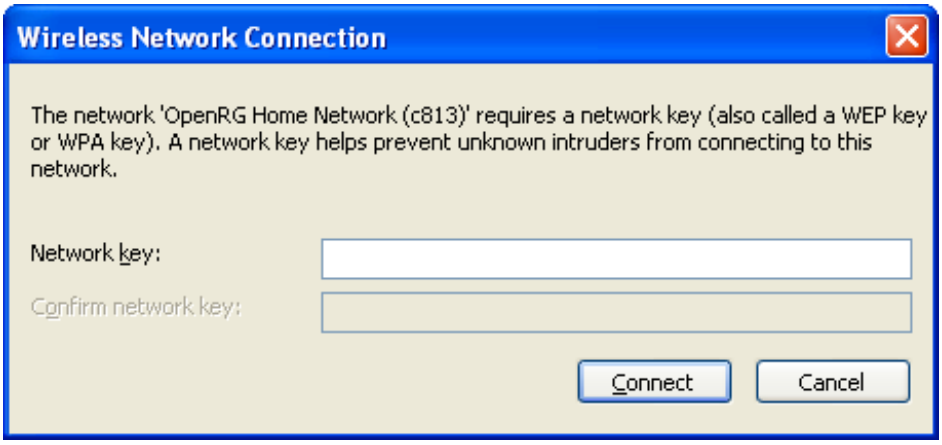
Wireless Network Connection
The network 'OpenRG Home Network (c813)' requires a network key (also called a WEP key or WPA key). A network key helps prevent unknown intruders from connecting to this network.
Network key:
Confirm network key:
Connect
Cancel

Figure 2.4 WPA Network Key Authentication

Enter the WPA password. This case sensitive password can be found on the sticker located at the bottom of the gateway, and can be changed in the 'Wireless' menu item under the 'Home' tab. After the connection is established, its status changes to 'Connected'.

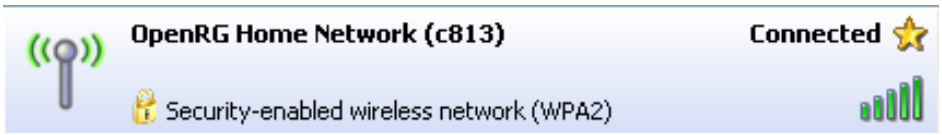

Figure 2.5 Connected Wireless Network

A balloon appears in the notification area, announcing the successful initiation of the wireless connection.

Figure 2.6 Wireless Connection Information

3. If you had selected the default "Medium" security level during the installation wizard, any attempt to browse the Internet will require Web authentication. The following screen appears, requiring you to provide your username and password.

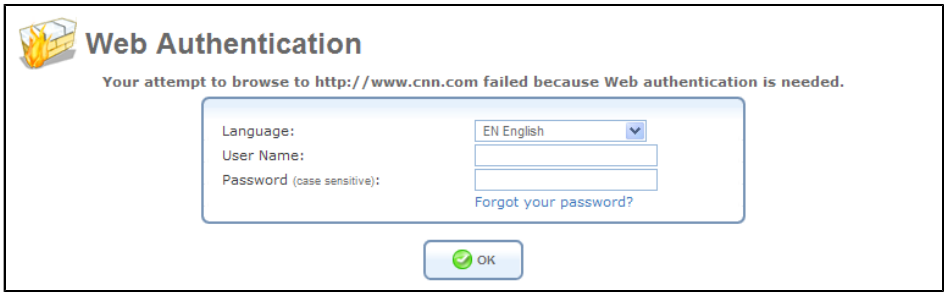

Figure 2.7 Web Authentication

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Enter your username and password. You will be redirected to your requested Internet address.

In case you have forgotten your wireless password, click 'Forgot your password?' to display a screen that offers a number of password recovery methods. For more information, refer to the 'Recovering Your Wireless Network's Password' section of the OpenRG Administrator Manual.

4. Open an Internet browser and browse to any site.

The 'Home' tab will now display the connected wireless computer.

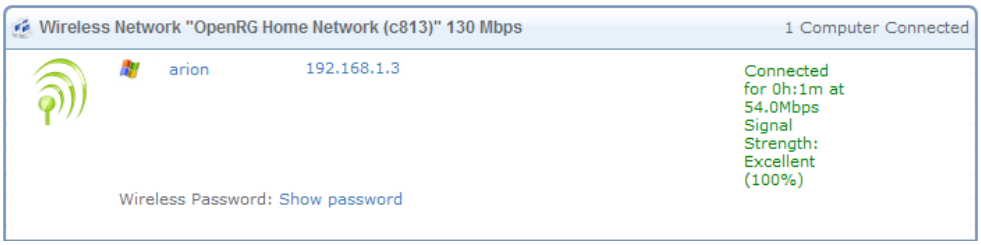

Figure 2.8 Connected Wireless Computer

2.1.2 Viewing the Local Network

The 'Network Devices' section also displays OpenRG's local network, which includes all computers that have joined the gateway's network, their IP addresses, and connection speed (Figure 2.1).

To view more information on a specific computer, click its respective link. The 'Host Information' screen appears.

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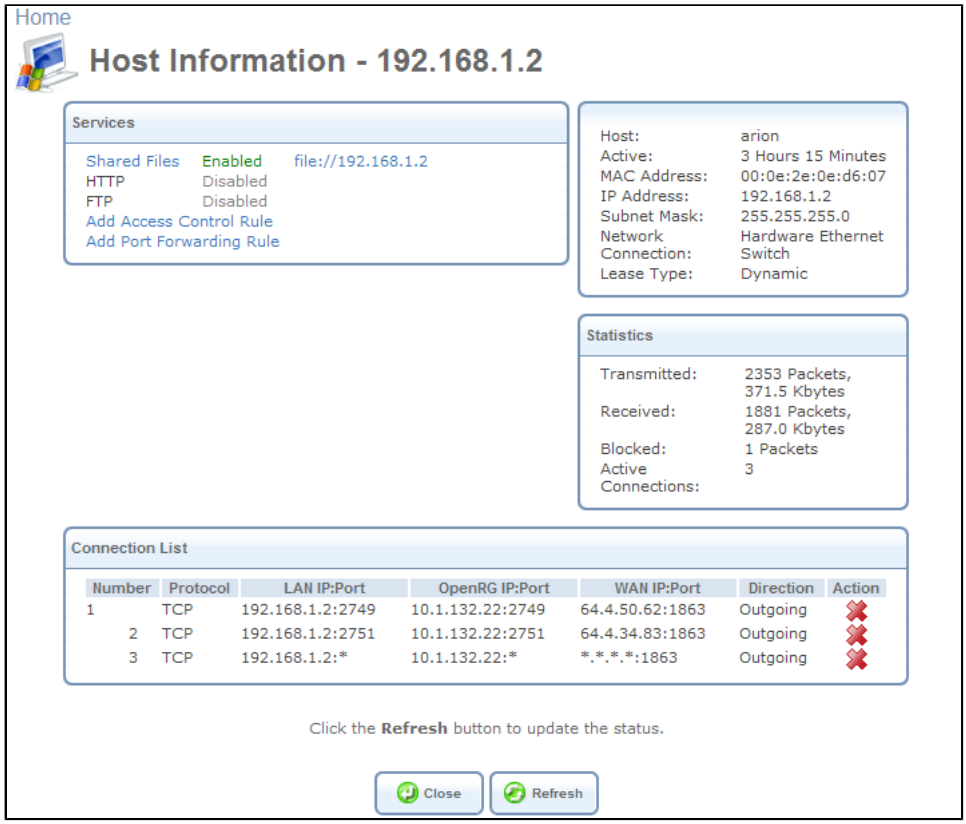

Figure 2.9 Host Information

This screen presents all of the information relevant to the connected computer, such as connection information, available services, and traffic statistics.

Services This section lists the services on the computer that are available to other computers from the LAN. When a service is accessible from the LAN, you can activate it by clicking its name. When a service is accessible via Web access, you can activate it by clicking the 'Web Access' link that appears.

Connection Information This section displays various details regarding the computer's connection settings.

Statistics This section displays the computer's traffic statistics, such as the number and size of transmitted and received packets.

Connection List This section displays the list of connections opened by the computer on OpenRG's firewall. The table displays the computer's source LAN IP address and port, the gateway's IP address and port to which it is translated, and the destination WAN IP address and port.

2.1.3 Authenticating Wireless Network Devices

When attempting to connect to the gateway's network from a wireless computer, a login session is used for authentication and connection. However, you may wish connect other wireless devices to the gateway, such as gaming devices, cameras, etc., in which a login session in is

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not possible due to the lack of an interface. In such a case, a simple authentication procedure is required in the 'Home' screen.

A preliminary step is to search for the gateway's wireless network from the device itself. Refer to the device's documentation to learn how to perform this search. When OpenRG detects a wireless request, the device is displayed under the relevant wireless connection.

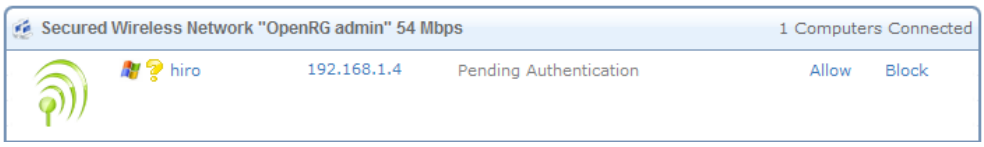

Figure 2.10 Wireless Authentication – Pending

To allow this device to connect to your gateway, click 'Allow'. The screen refreshes, updating the status of the device.

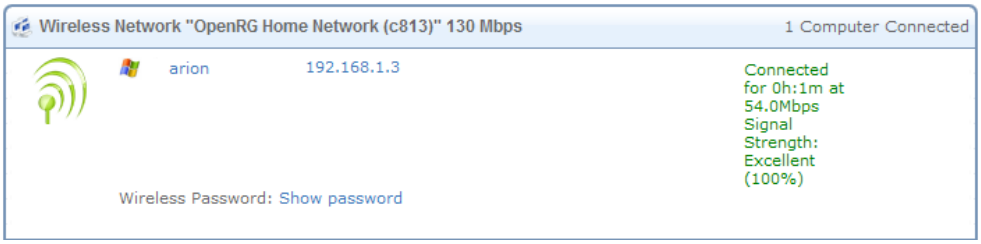

Figure 2.11 Wireless Authentication – Authenticated

The device is now connected. Similarly, you can use the 'Block' link in order to log the device out of your network.

2.1.4 Viewing Attached Devices

The 'Attached Devices' section displays the peripheral devices connected to your gateway. These may include storage devices and telephones. For example, connect a storage device and refresh the screen.

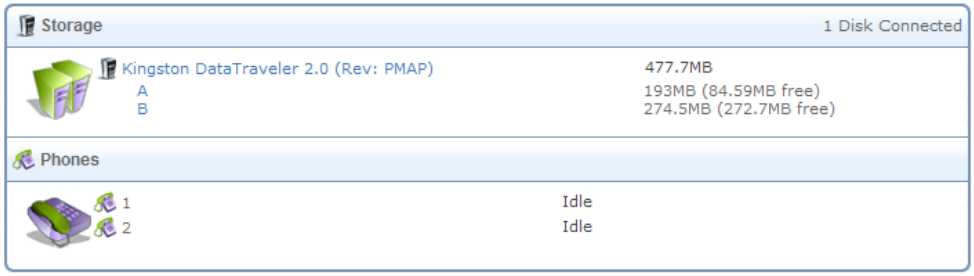

Figure 2.12 Connected Storage Device

Note: The 'Phones' section displays the phone extensions even when there are no connected telephones.

Similarly, this section displays other devices connected to the gateway. For more information on each device type, refer to its respective section of this manual.

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2.1.5 Viewing the System Status

The 'System Status' section of the 'Home' tab (see Figure 2.1) displays the following details:

- The Internet connection's type, speed capability, and data transmission mode. Click the 'Internet Connection' link for more details.
- The top five bandwidth consuming applications and computers are displayed in their respective sections in descending order. The current downstream and upstream volumes are also displayed for every application and computer.
- Internet connection information, which includes the connection type. Click the 'Internet Connection' headline for more details.
- System information, which includes the gateway's ID, software version and uptime. Click the 'System Information' headline for more details.

2.2 Viewing Your Network with Map View

The 'Map View' screen displays a graphical network map.

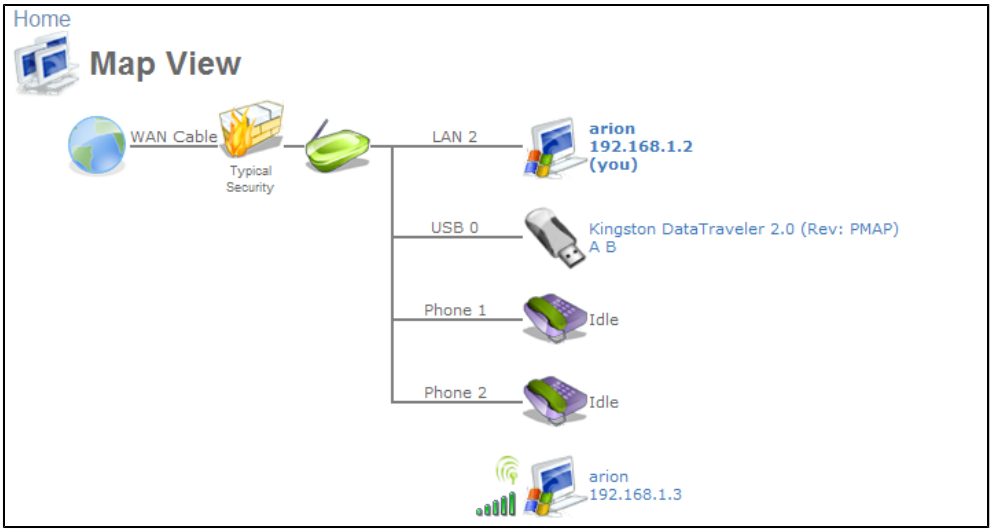

Figure 2.13 Home – Map View

The network map depicts the various network elements, such as the Internet connection, firewall, gateway, and local network computers and peripherals.

Represents the Internet

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Represents the gateway's Firewall. Click this icon to configure your security settings. For more information, refer to the 'Firewall' section of the OpenRG Administrator Manual.

Represents your gateway

The network map dynamically represents the network objects connected to your gateway. OpenRG recognizes commercial operating systems and game devices, which are represented by their respective icons.

Represents a wired/wireless computer (host) connected to the gateway. This host is either a DHCP client that has received an IP lease from OpenRG, or a host with a static IP address, auto-detected by OpenRG. Note that OpenRG will recognize a physically connected host and display it in the Network Map only after network activity from that host has been detected (e.g. trying to browse to the WBM or to surf the Internet). OpenRG will also display incoming connections of types PPTP, L2TP, and IPSec. Click this icon to view network information for the corresponding host.

Represents a host whose DHCP lease has expired and not renewed. The DHCP lease is renewed automatically, unless the host is no longer physically connected to OpenRG. The disconnected host's icon will disappear from the network map during the next scheduled IP lease query, performed by OpenRG's DHCP server.

Note: This icon also represents a static IP host that has no network activity.

Represents a Windows™ host connected to your gateway.

Represents a wireless host connected to your gateway.

Represents a printer connected to your gateway.

Represents a telephone connected to your gateway.

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Represents a USB stick (disk-on-key) connected to your gateway.

Represents a USB hard drive connected to your gateway.

OpenRG's standard network map displays devices that the gateway recognized and granted a DHCP lease.

2.3 Installation Wizard

The installation wizard is the first and foremost configuration procedure, which automatically diagnoses your network environment and configures its components. It is a step-by-step procedure that guides you through establishing an Internet connection, a wireless network, and helps you to subscribe for different services by creating a Jungo.net account. The wizard progress box, located at the right hand side of the screen, provides a monitoring tool for its steps during the installation progress.

Figure 2.14 Welcome to OpenRG Installation Wizard

To start the installation wizard, perform the following:

1. Select the desired language and click 'Next' to continue. The 'Login Setup' screen appears.

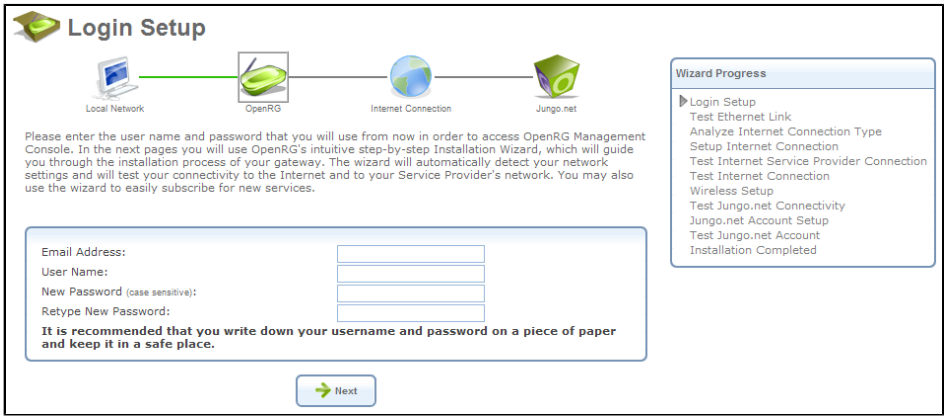
Login Setup
Local Network
OpenRG
Internet Connection
Jungo.net
Wizard Progress
Login Setup
Test Ethernet Link
Analyze Internet Connection Type
Setup Internet Connection
Test Internet Service Provider Connection
Test Internet Connection
Wireless Setup
Test Jungo.net Connectivity
Jungo.net Account Setup
Test Jungo.net Account
Installation Completed
Please enter the user name and password that you will use from now in order to access OpenRG Management Console. In the next pages you will use OpenRG's intuitive step-by-step Installation Wizard, which will guide you through the installation process of your gateway. The wizard will automatically detect your network settings and will test your connectivity to the Internet and to your Service Provider's network. You may also use the wizard to easily subscribe for new services.
Email Address:
User Name:
New Password (case sensitive):
Retype New Password:
It is recommended that you write down your username and password on a piece of paper and keep it in a safe place.
Next

Figure 2.15 Login Setup

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2. Enter a valid email address. It will be used by your service provider for sending you important service information.

3. The 'User Name' field is auto-completed by the username part of your email address. You can enter another username, which may only consist of letters and numbers.

4. Enter a password, and retype it in the next field to verify its correctness.

> Note: It is recommended to write down your login details on a piece of paper, and store it in a safe place.

5. Click 'Next'. The wizard is now ready to begin your gateway's configuration.

Home
Installation Wizard
Local Network
OpenRG
Internet Connection
Jungo.net
Welcome to OpenRG's step-by-step Installation Wizard. This wizard will guide you through your Internet connection and wireless network setup, and will help you to subscribe for services that are available to you as an OpenRG user. Please note that using the step-by-step installation wizard will override your existing gateway configuration.
To continue, click Next.
Next
Exit
Wizard Progress
Login Setup
Test Ethernet Link
Analyze Internet Connection Type
Setup Internet Connection
Test Service Provider Connection
Test Internet Connection
Wireless Setup
Test Jungo.net Connectivity
Jungo.net Account Setup
Test Jungo.net Account
Installation Completed

Figure 2.16 Installation Wizard

6. Click 'Next'. The wizard procedure will commence, performing the steps listed in the progress box consecutively, stopping only if a step fails or if input is required. The following sections describe the wizard steps along with their success/failure scenarios. If a step fails, use the 'Retry' or 'Skip' buttons to continue.

> **Warning:** The installation wizard overrides all Internet connection settings, which you may have previously defined.

2.3.1 Step 1: Test Ethernet Link

The first step is a test of the Ethernet connection.

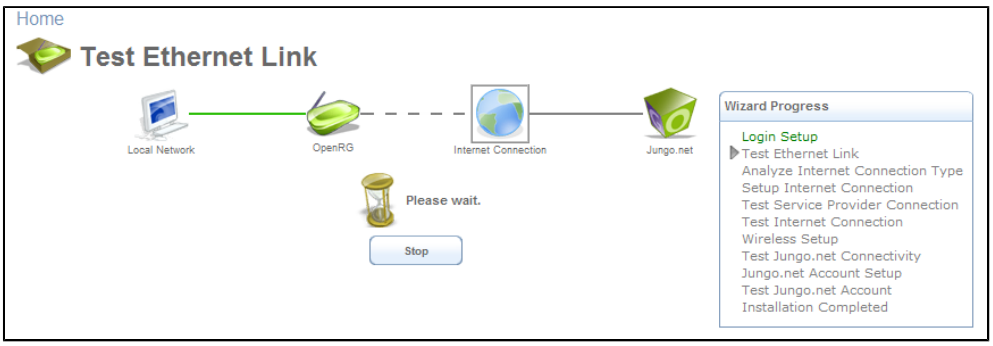

Figure 2.17 Test Ethernet Link

This step may fail if OpenRG cannot detect your Ethernet link (for example, if the cable is unplugged). In this case, the screen changes to the following.

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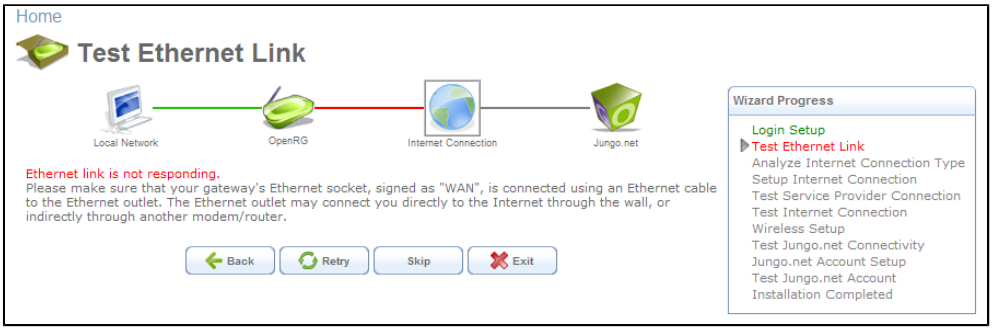

Figure 2.18 Test Ethernet Link – Failure

Verify that your Ethernet/DSL cable is connected properly, and click 'Retry'.

2.3.2 Step 2: Analyze Internet Connection Type

The next step is an analysis of your Internet connection.

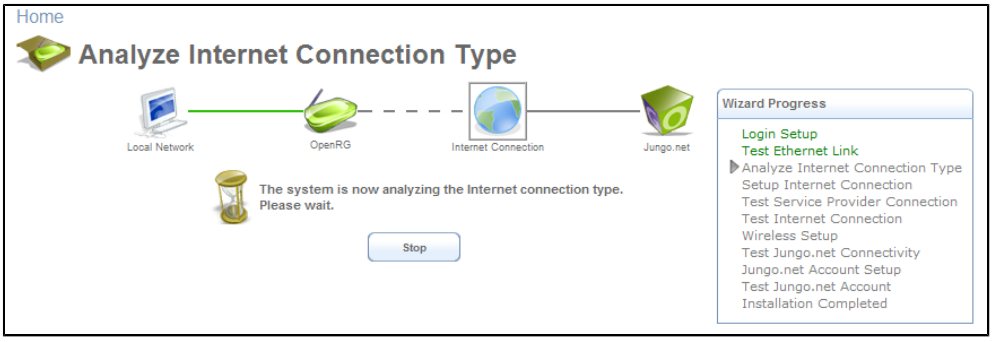

Figure 2.19 Analyze Internet Connection Type

This step may fail if OpenRG is unable to detect your Internet connection type.

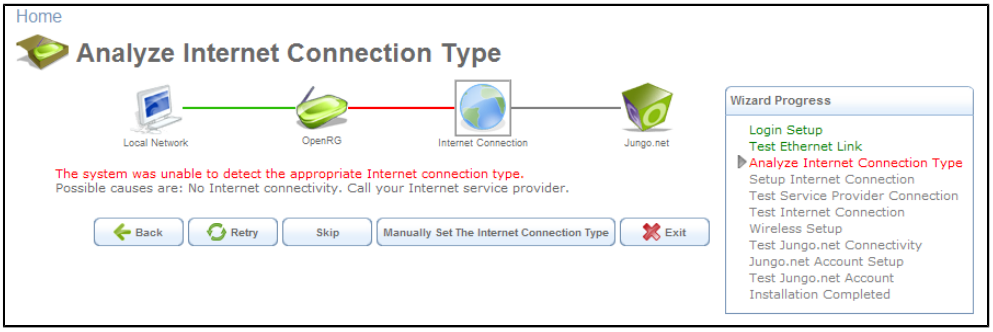

Figure 2.20 Analyze Internet Connection Type – Failure

In this case, you can manually set the Internet connection type, by clicking the corresponding button. The following screen appears.

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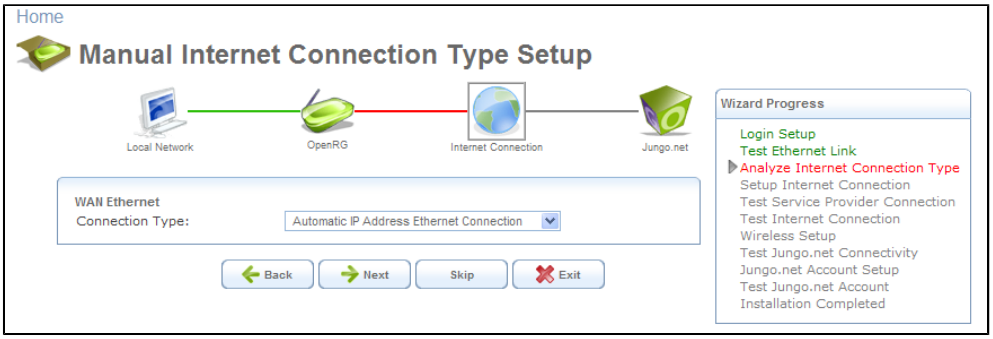

Figure 2.21 Manual Internet Connection Type Setup

2.3.3 Step 3: Setup Internet Connection

If your Internet connection requires login details provided by your Internet Service Provider (ISP) (e.g. when using PPPoE), the following screen appears.

Figure 2.22 Internet Account Information

Enter your user name and password and click 'Next'. Failure to enter the correct details yields the following message. Click 'Back' and try again.

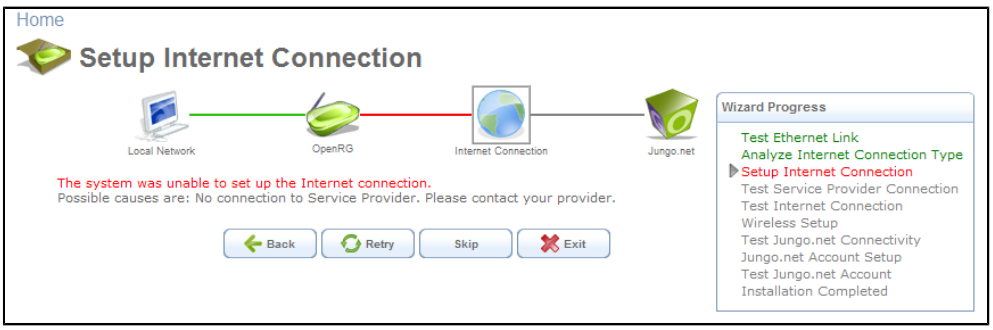

Figure 2.23 Setup Internet Connection

You may have forgotten your login details, issued by your ISP. OpenRG saves the username and password of the PPPoE or PPPoA connection to the ISP, even if it is restored to the factory default settings. When restoring the connection with the installation wizard, OpenRG will offer your old login details.

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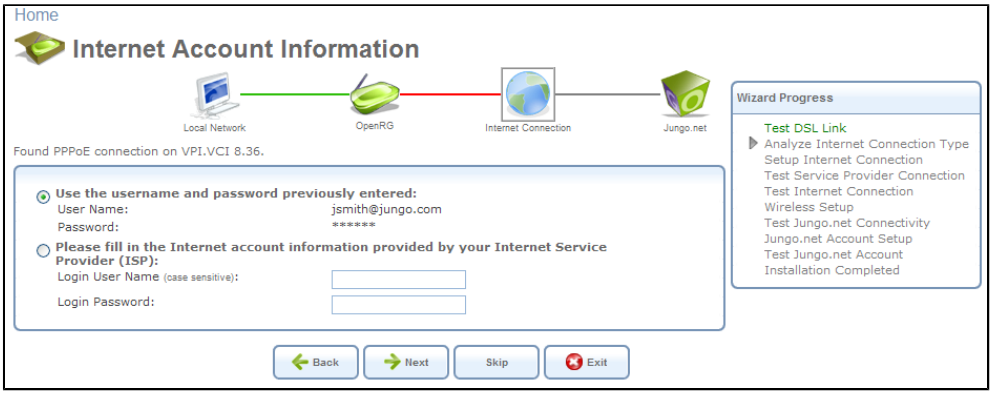

Figure 2.24 Internet Account Information

2.3.4 Step 4: Test Service Provider Connection

This step tests the connectivity to your ISP.

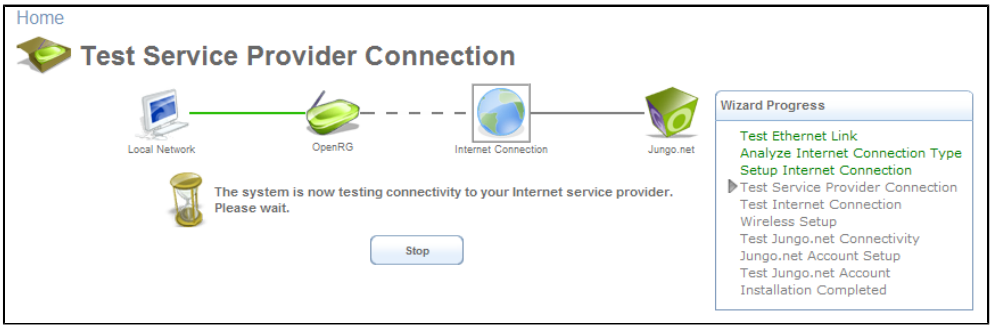

Figure 2.25 Test Service Provider Connection

2.3.5 Step 5: Test Internet Connection

This step tests the connectivity to the Internet.

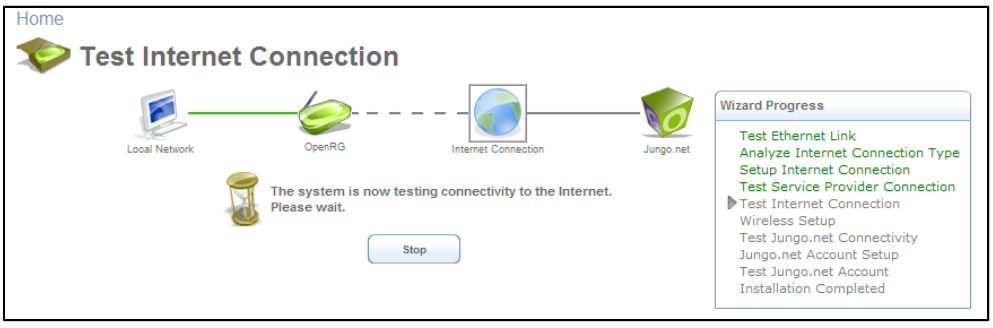

Figure 2.26 Test Internet Connection

2.3.6 Step 6: Wireless Setup

This step enables you to rename your wireless network, as well as change its security level.

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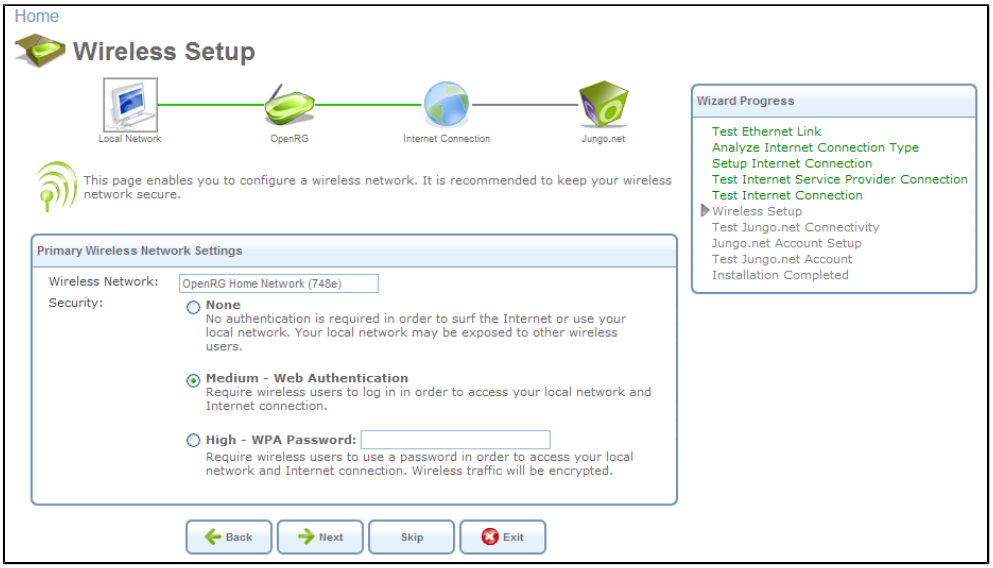
Home
Wireless Setup
Local Network
OpenRG
Internet Connection
Jungo.net
This page enables you to configure a wireless network. It is recommended to keep your wireless network secure.
Primary Wireless Network Settings
Wireless Network:
OpenRG Home Network (748e)
Security:
None
No authentication is required in order to surf the Internet or use your local network. Your local network may be exposed to other wireless users.
Medium - Web Authentication
Require wireless users to log in in order to access your local network and Internet connection.
High - WPA Password:
Require wireless users to use a password in order to access your local network and Internet connection. Wireless traffic will be encrypted.
Back
Next
Skip
Exit
Wizard Progress
Test Ethernet Link
Analyze Internet Connection Type
Setup Internet Connection
Test Internet Service Provider Connection
Test Internet Connection
Wireless Setup
Test Jungo.net Connectivity
Jungo.net Account Setup
Test Jungo.net Account
Installation Completed

Figure 2.27 Wireless Setup

OpenRG assigns a default name for its wireless network, which you may later change. Select the wireless security level. The default "Medium" level secures your network by requiring users to provide a password in order to connect. "High" level utilizes the Wi-Fi Protected Access (WPA) protocol, requiring a password (network key) as well, but also encrypts the wireless traffic. When selecting this option, enter an eight-character password in the provided field. Click 'Next' to continue.

2.3.6.1 Setup via Wireless Connection

If you are running the installation wizard while being connected to OpenRG via a wireless connection, the wizard does not change the default SSID (to prevent you from disconnecting). If you choose to change it manually, the following screen appears, requesting that you re-establish your wireless connection (from your computer) before proceeding with the wizard.

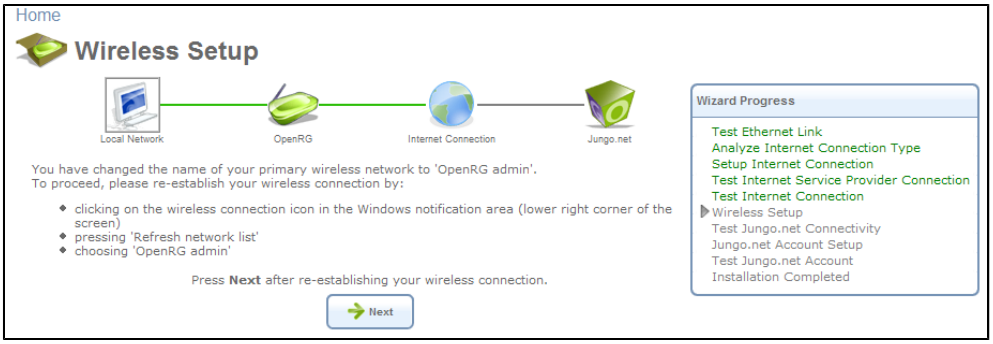
Home
Wireless Setup
Local Network
OpenRG
Internet Connection
Jungo.net
You have changed the name of your primary wireless network to 'OpenRG admin'.
To proceed, please re-establish your wireless connection by:
clicking on the wireless connection icon in the Windows notification area (lower right corner of the screen)
pressing 'Refresh network list'
choosing 'OpenRG admin'
Press Next after re-establishing your wireless connection.
Next
Wizard Progress
Test Ethernet Link
Analyze Internet Connection Type
Setup Internet Connection
Test Internet Service Provider Connection
Test Internet Connection
Wireless Setup
Test Jungo.net Connectivity
Jungo.net Account Setup
Test Jungo.net Account
Installation Completed

Figure 2.28 Wireless Setup

This screen also appears after selecting the High wireless security level, or after changing the previously entered WPA password (see Figure 2.27).

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2.3.6.2 Additional SSIDs with Virtual Access Points

If your gateway supports multiple virtual access points, an additional pre-configured WPA-secured wireless network is displayed in 'Wireless Setup' screen.

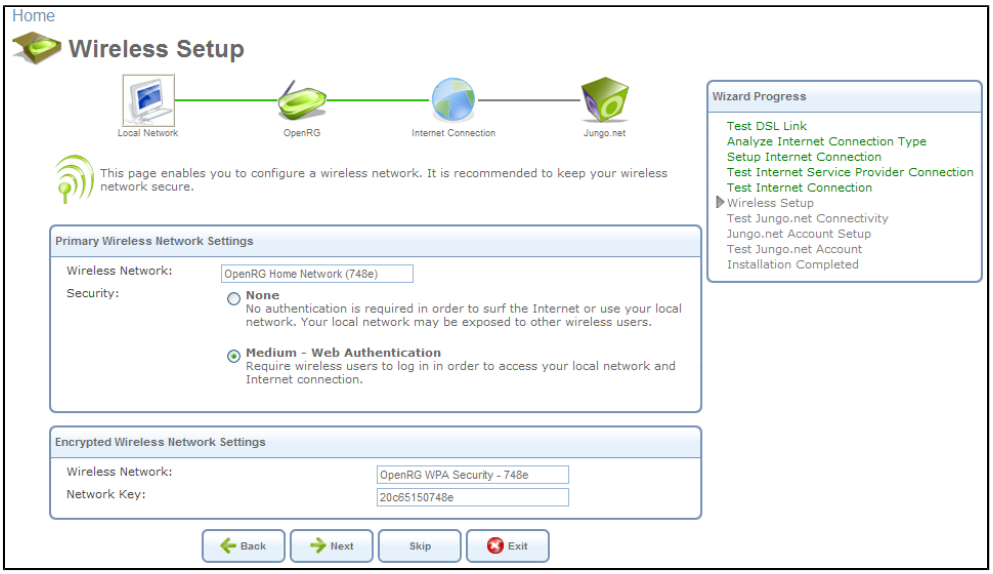

Figure 2.29 Wireless Setup

You can change the default name and network key (password) of this encrypted wireless network in their respective text fields (clicking 'Next' will save the new details). This wireless network will also appear in the 'Network Connections' screen under the 'System' tab, where it can be edited or deleted such as any other network connection.

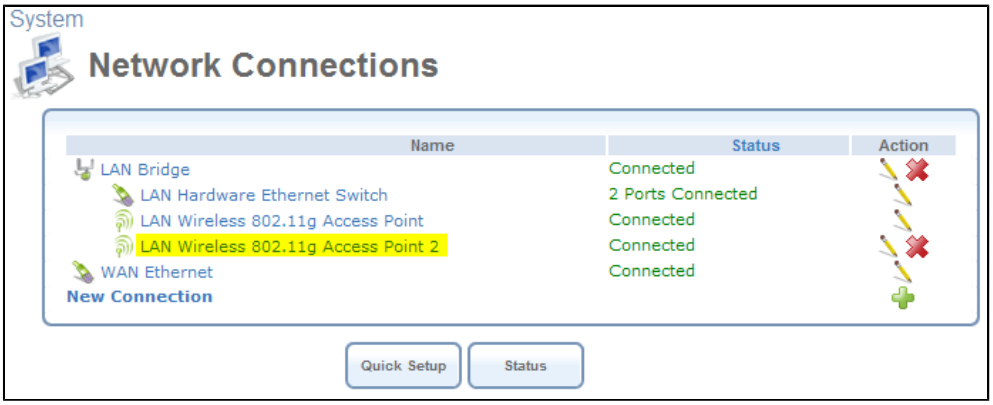

Figure 2.30 Network Connections

Note: In order to delete this connection, you must first remove it from under the LAN bridge.

2.3.7 Step 10: Installation Completed

This screen provides a summary of all the above Internet connection configuration steps and their results. Click 'Finish' to complete the wizard procedure.

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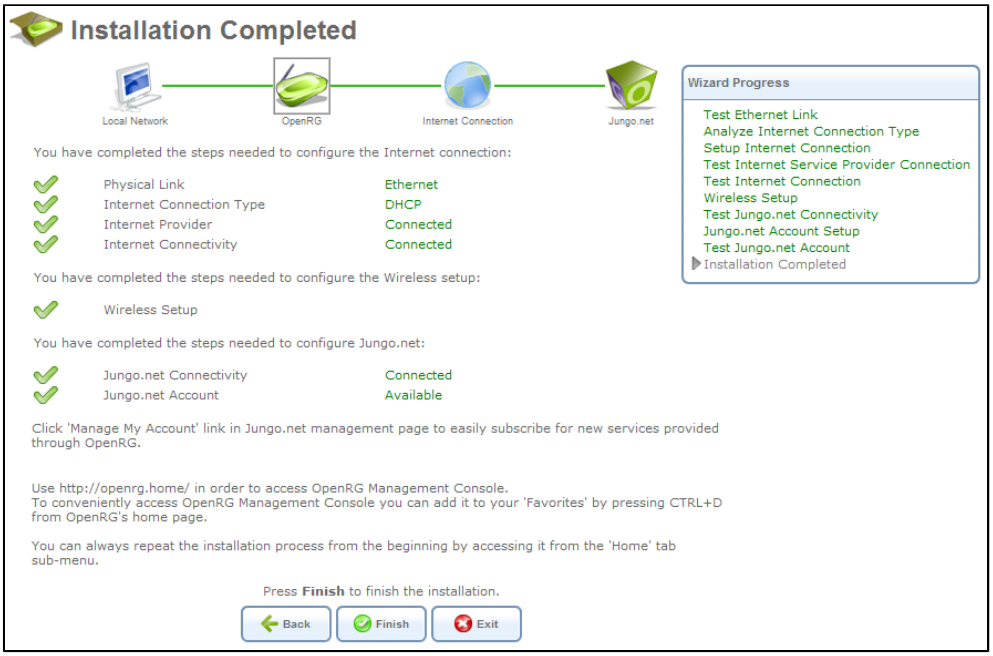
Installation Completed
Local Network
OpenRG
Internet Connection
Jungo.net
Wizard Progress
Test Ethernet Link
Analyze Internet Connection Type
Setup Internet Connection
Test Internet Service Provider Connection
Test Internet Connection
Wireless Setup
Test Jungo.net Connectivity
Jungo.net Account Setup
Test Jungo.net Account
Installation Completed
You have completed the steps needed to configure the Internet connection:
Physical Link Ethernet
Internet Connection Type DHCP
Internet Provider Connected
Internet Connectivity Connected
You have completed the steps needed to configure the Wireless setup:
Wireless Setup
You have completed the steps needed to configure Jungo.net:
Jungo.net Connectivity Connected
Jungo.net Account Available
Click 'Manage My Account' link in Jungo.net management page to easily subscribe for new services provided through OpenRG.
Use http://openrg.home/ in order to access OpenRG Management Console.
To conveniently access OpenRG Management Console you can add it to your 'Favorites' by pressing CTRL+D from OpenRG's home page.
You can always repeat the installation process from the beginning by accessing it from the 'Home' tab sub-menu.
Press Finish to finish the installation.
Back
Finish
Exit

Figure 2.31 Installation Completed

2.4 Configuring Your Wireless Connection

The 'Wireless' menu item concentrates the wireless LAN settings of your gateway. This screen presents OpenRG's wireless connection settings, and enables you to change them according to your needs.

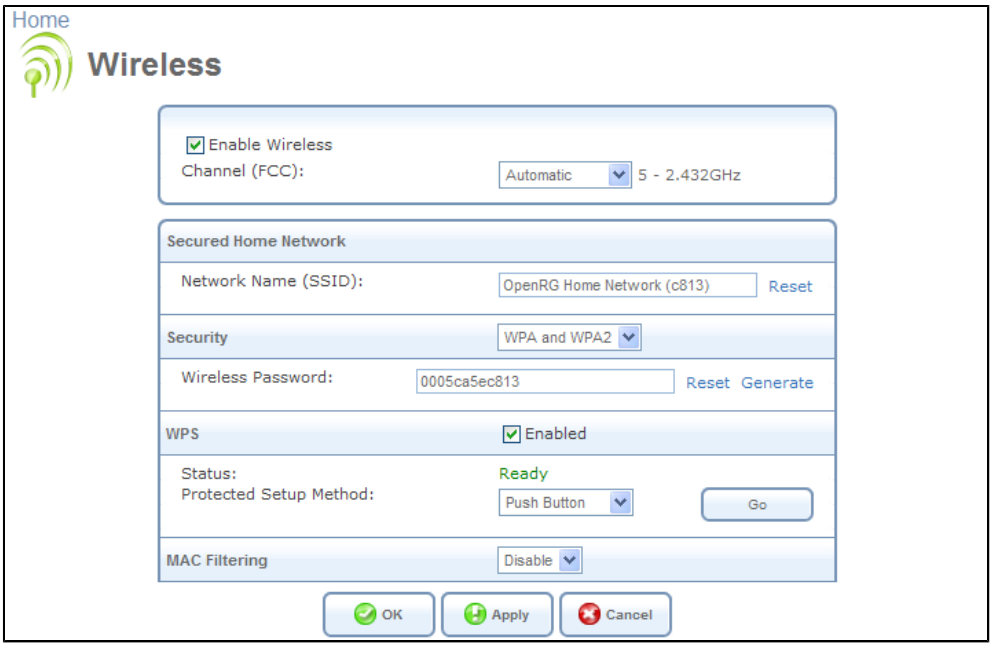

Figure 2.32 Wireless Overview

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Warning: Misconfiguration of this interface may harm its performance and result in an inoperable gateway. Therefore, it is highly recommended that you refrain from changing the default settings, unless you have a strong knowledge and understanding of the interface's parameters.

Enable Wireless Select or deselect this check box to enable or disable the wireless interface.

Channel All devices in your wireless network broadcast on different channels. Leaving this parameter on Automatic ensures that OpenRG continuously scans for the most available wireless channel in your area. It is possible to select a channel manually if you have information regarding the wireless channels used in your vicinity. The channels available depend on the regulatory authority (stated in brackets) to which your gateway conforms. For example, the European regulatory authority (ETSI) has allocated 13 available channels, while the US regulatory authority (FCC) has allocated 11 available channels.

Network Name (SSID) The SSID is the network name shared among all points in a wireless network. It is case-sensitive and must not exceed 32 characters (use any of the characters on the keyboard). For added security, you may change the default SSID to a unique name.

SSID Broadcast By default, OpenRG broadcasts the name of its wireless network (SSID). For security reasons, you may choose to hide your wireless network by deselecting this check box. Wireless clients will only be able to connect by manually typing the SSID in their wireless client applications (whether Windows or a third party application), rather than choosing it from the list of available wireless networks.

802.11 Mode Select the desired wireless connection type. By default, it is set to 802.11g/n. Note that 802.11b legacy devices are not compatible with modes 802.11g/n and 802.11g Only.

Allow management from wireless clients Select this check box if you wish to allow authenticated wireless clients to access your gateway's WBM.

Security Use this section to configure your wireless security settings. Select the type of security protocol from the corresponding drop-down menu. The screen refreshes, presenting each protocol's configuration respectively.

- **WPA** – a data encryption method for 802.11 wireless LANs.

  Authentication Method Select the authentication method you would like to use. You can choose between Pre-Shared Key and 802.1x.

  Pre-Shared Key This entry appears only if you had selected this authentication method. Enter your encryption key in the 'Pre-Shared Key' field. You can use either an ASCII or a Hex value by selecting the value type in the drop-down menu provided.

  Encryption Algorithm Select between Temporal Key Integrity Protocol (TKIP) and Advanced Encryption Standard (AES) for the encryption algorithm, or both of them.

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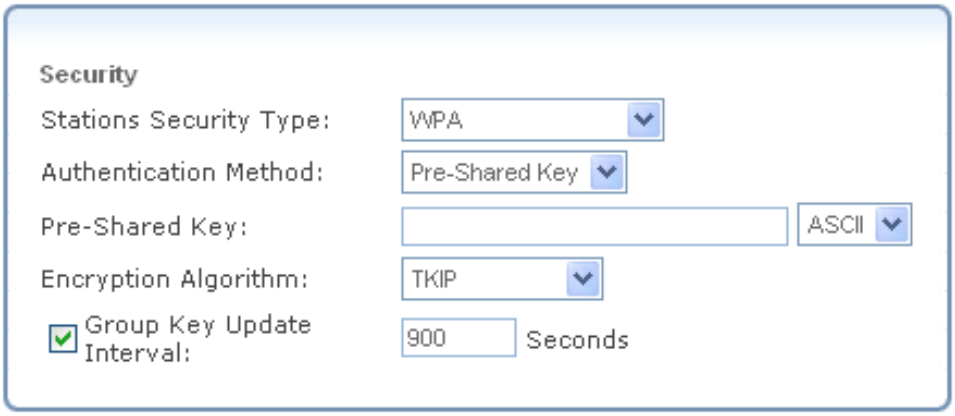

Figure 2.33 WPA Wireless Security Parameters

- **WPA2** – an enhanced version of WPA, and defines the 802.11i protocol.

  Authentication Method Select the authentication method you would like to use. You can choose between Pre-Shared Key and 802.1x.

  Pre-Shared Key This entry appears only if you had selected this authentication method. Enter your encryption key in the 'Pre-Shared Key' field. You can use either an ASCII or a Hex value by selecting the value type in the drop-down menu provided.

  Encryption Algorithm The encryption algorithm used with WPA2 is the AES only.

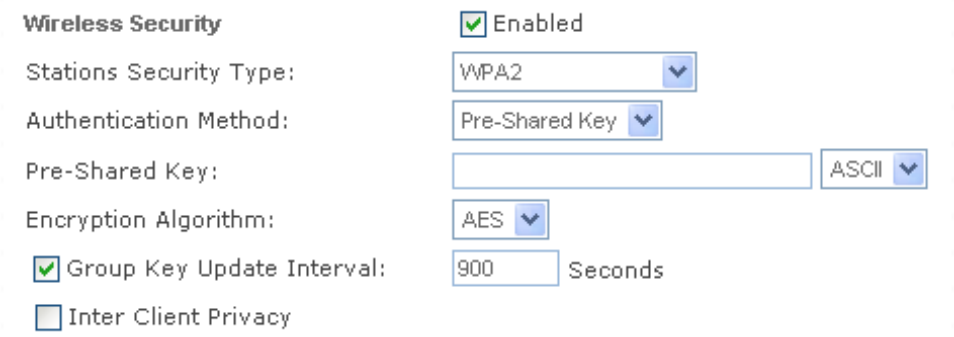

Figure 2.34 WPA2 Wireless Security Parameters

- **WPA and WPA2** – a mixed data encryption method, which utilizes both WPA and WPA2.

  Authentication Method Select the authentication method you would like to use. You can choose between Pre-Shared Key and 802.1x.

  Pre-Shared Key This entry appears only if you had selected this authentication method. Enter your encryption key in the 'Pre-Shared Key' field. You can use either an ASCII or a Hex value by selecting the value type in the drop-down menu provided.

  Encryption Algorithm The encryption algorithm used for WPA and WPA2 is either the AES only, or both AES and TKIP.

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Wireless Password The wireless password required to connect to the gateway's wireless network. You may change the default password by either clicking 'Generate' or entering an 8 character long password, and clicking 'Apply'. Note that clicking 'Reset' will return the gateway's default password.

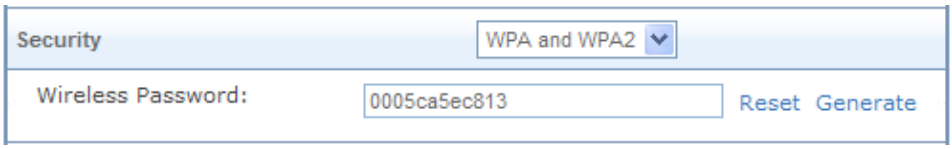

Figure 2.35 WPA and WPA2

- **WEP** – a data encryption method utilizing a statically defined key as the wireless password. Note that the static key must be defined in the wireless Windows client as well, as described below.

  Active Select the encryption key to be activated.

  Key Length Select the key length in bits: 40 or 104 bits.

  Encryption Key Type Select the character type for the key: ASCII or HEX.

  Wireless Password Enter the wireless password required to connect to the gateway's wireless network.

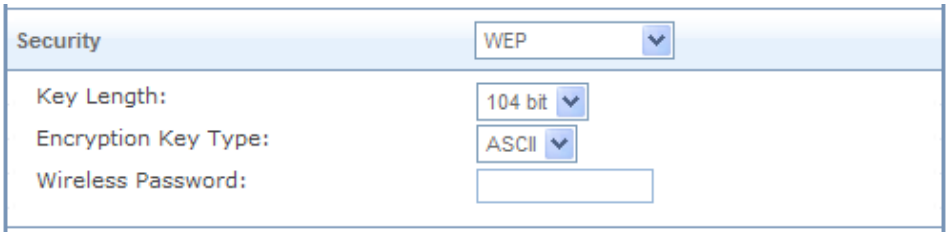

Figure 2.36 WEP

The encryption key (wireless password) must be defined in the wireless Windows computer as well. This is done in the 'Connection Properties Configuration' window:

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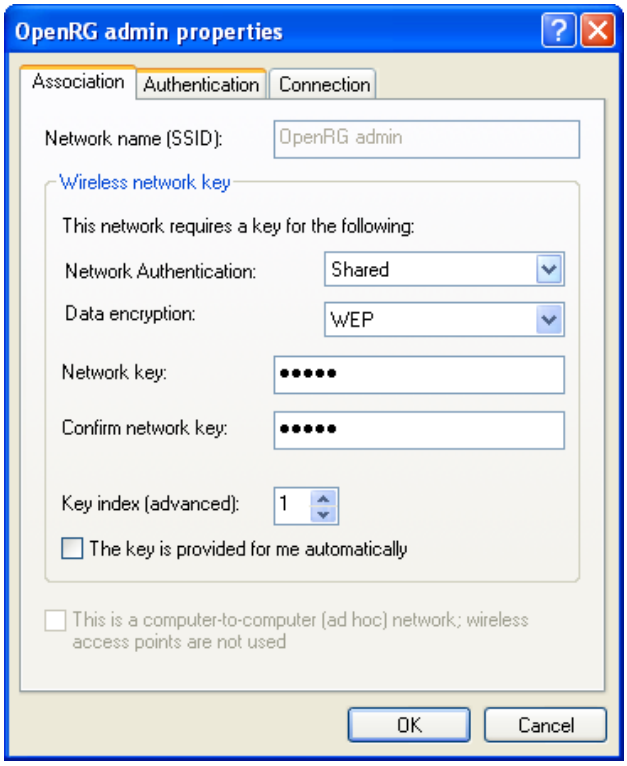

Figure 2.37 Connection Properties Configuration

1. In the 'Network Authentication' drop-down menu, select "Shared".
2. In the 'Data Encryption' drop-down menu, select "WEP".
3. Enter your encryption key in both the 'Network key' and the 'Confirm network key' fields.

- **Unsecured** Selecting this option disables security on your wireless connection. Any wireless computer in your area will be able to connect to the Internet using your connection's bandwidth.

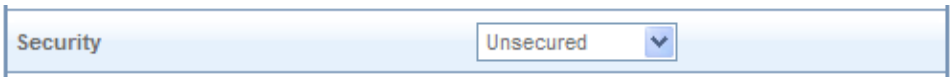

Figure 2.38 Disabled Wireless Security

- **Authentication Only** When selecting this option, wireless clients attempting to connect to the wireless connection will receive OpenRG's main login screen, along with the following attention message:

Figure 2.39 Web Authentication Needed

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By logging into the WBM, clients authenticate themselves and are then able to use the connection. OpenRG keeps record of authenticated clients. To clear this list, click the 'Clean Mac List' button. Clients will have to re-authenticate themselves in order to use the wireless connection.

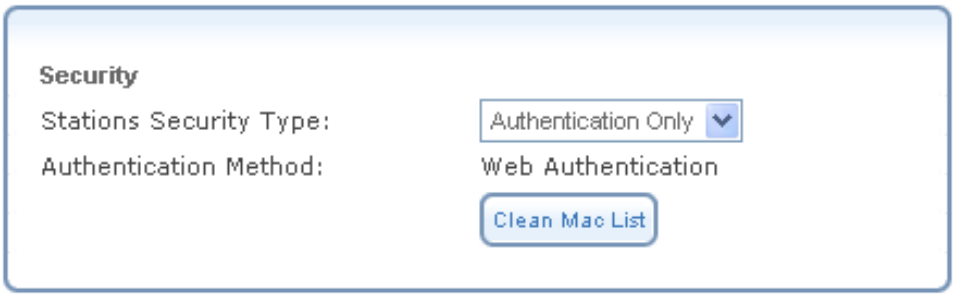

Figure 2.40 Authentication Only Wireless Security Parameters

Wi-Fi Protected Setup (WPS) WPS is a method for simplifying the security setup and management of wireless networks.

Status Indicates the WPS status. "Ready" means that the system is ready to negotiate with incoming wireless clients, or "enrollees".

Protected Setup Method OpenRG supports two setup methods, "Push Button" (the default) and "Client Pin Code". These are the methods used by wireless clients when seeking an access point.

- **Push Button** – The enrollment is initiated by either pressing a physical button on the wireless client or through its software. After initiating the enrollment, click 'Go' or press the WPS button on the top of the gateway for the devices to establish a connection.

- **Client Pin Code** – The enrollment is initiated by the wireless client's software, which also provides a pin code. To comply with this method, select this option from the drop-down menu. The screen refreshes to provide a field for entering the pin code:

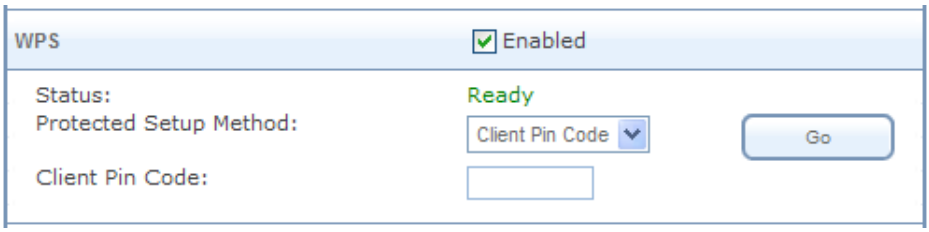

Figure 2.41 Protected Setup Method – Pin Code

In this field, enter the eight digit pin code provided by the wireless client's software. Click 'Go' for the devices to establish a connection.

When attempting to connect a wireless client to OpenRG, you must be aware of its setup method. A connection attempt will time out after two minutes if no connection is established. If a connection is established, the 'Status' field will change to reflect that.

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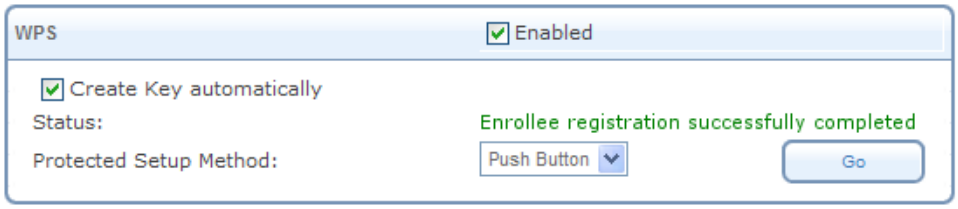

Figure 2.42 Successful Enrollee Registration

Note that WPS is only supported with WPA security. Therefore, when 'WEP' or 'Unsecured' are selected in the 'Security' drop-down menu, the following message appears in the WPS section.

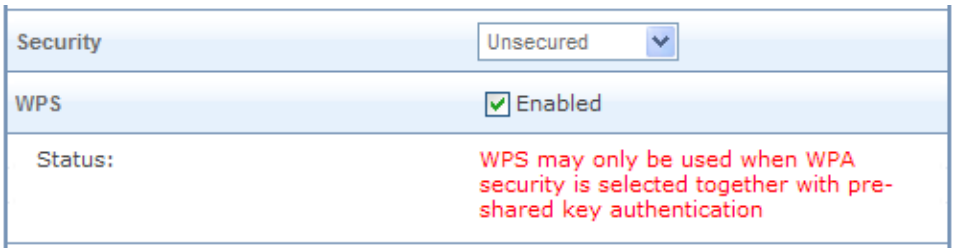

Figure 2.43 WPS Not Supported

MAC Filtering You can filter wireless clients according to their MAC addresses, either allowing or denying them access to your wireless network. To add a MAC filtering rule, choose the action to be performed (allow or deny) in the drop-down menu. Then, click 'New MAC Address'. The 'MAC Filtering Settings' screen appears.

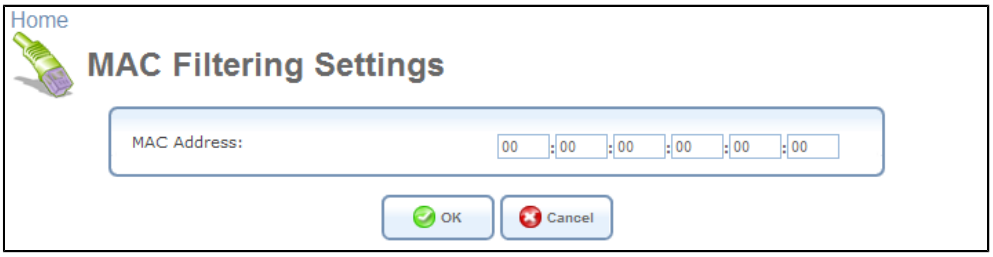

Figure 2.44 MAC Filtering Settings

Enter the MAC address (in hexadecimal values) to be filtered and click 'OK'. The MAC address entry appears.

Figure 2.45 MAC Filtering Entry

Note that when 'Allow' is selected, only wireless clients listed in this table will be able to connect. When 'Deny' is selected, all *but* wireless clients listed will be able to connect.

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3

Internet Connection

3.1 Viewing Your Internet Connection Properties

The 'Overview' screen provides general information regarding your Internet connection, such as the connection's status, protocol, speed, duration, as well as the gateway's external IP address and networking parameters. You can use this screen to quickly view your Internet connection status.

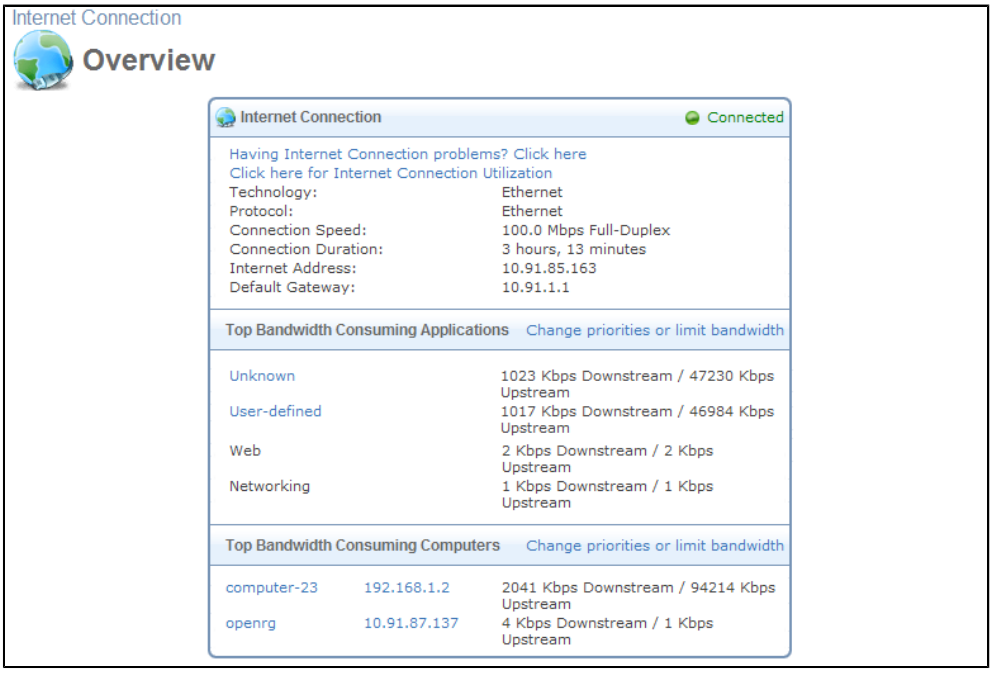
Internet Connection
Overview
Internet Connection
Connected
Having Internet Connection problems? Click here
Click here for Internet Connection Utilization
Technology: Ethernet
Protocol: Ethernet
Connection Speed: 100.0 Mbps Full-Duplex
Connection Duration: 3 hours, 13 minutes
Internet Address: 10.91.85.163
Default Gateway: 10.91.1.1
Top Bandwidth Consuming Applications
Change priorities or limit bandwidth
Unknown 1023 Kbps Downstream / 47230 Kbps Upstream
User-defined 1017 Kbps Downstream / 46984 Kbps Upstream
Web 2 Kbps Downstream / 2 Kbps Upstream
Networking 1 Kbps Downstream / 1 Kbps Upstream
Top Bandwidth Consuming Computers
Change priorities or limit bandwidth
computer-23 192.168.1.2 2041 Kbps Downstream / 94214 Kbps Upstream
openrg 10.91.87.137 4 Kbps Downstream / 1 Kbps Upstream

Figure 3.1 Internet Connection – Overview

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The following links are available:

- **Have Internet Connection problems? Click here** This link routes you to the 'Troubleshoot' screen, where you can run tests in order to diagnose and resolve Internet connectivity problems.

- **Click Here For Internet Connection Utilization** Click this link to analyze the traffic usage of your WAN connection (for more information, refer to Section 4.3).

In addition, this screen displays OpenRG's top bandwidth consuming applications and computers, described in Section 4.3.2.

3.2 Configuring Your Internet Connection

The 'Settings' screen provides basic configuration options for the different types of Internet connections supported by OpenRG.

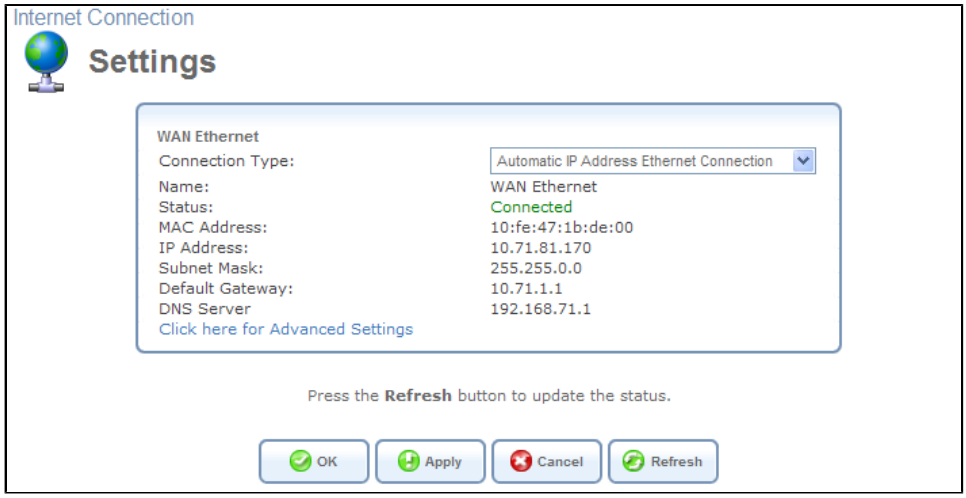

Figure 3.2 Internet Connection – Settings

If you are already connected to the Internet, this screen provides information on your connection. The drop-down menu provides the WAN connection types supported by OpenRG.

Click the 'Click here for Advanced Settings' link at anytime to navigate to your WAN connection's properties page. The 'WAN Ethernet Properties' screen appears.

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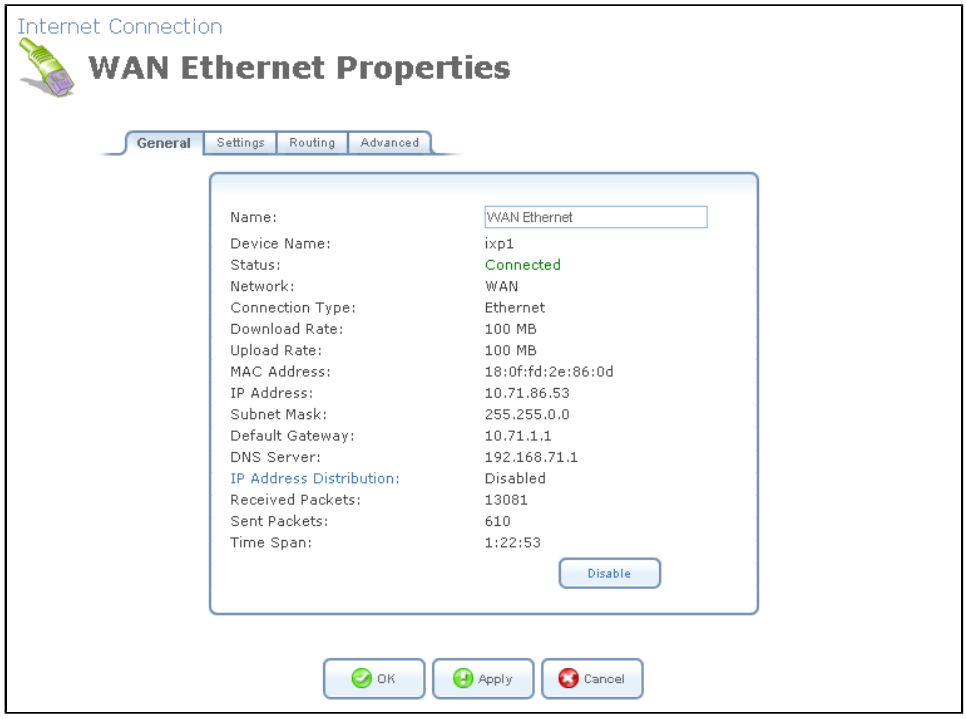

Figure 3.3 WAN Ethernet Properties

This screen provides all the configuration options for your WAN connection. For more information, refer to the 'WAN Ethernet' network connection in the 'System' chapter of the Administrator Manual.

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4

Services

4.1 Overviewing Your Services

The 'Overview' screen presents a summary of OpenRG's services and their current status (enabled/disabled). These services are configurable via their respective menu items under the 'Services' tab.

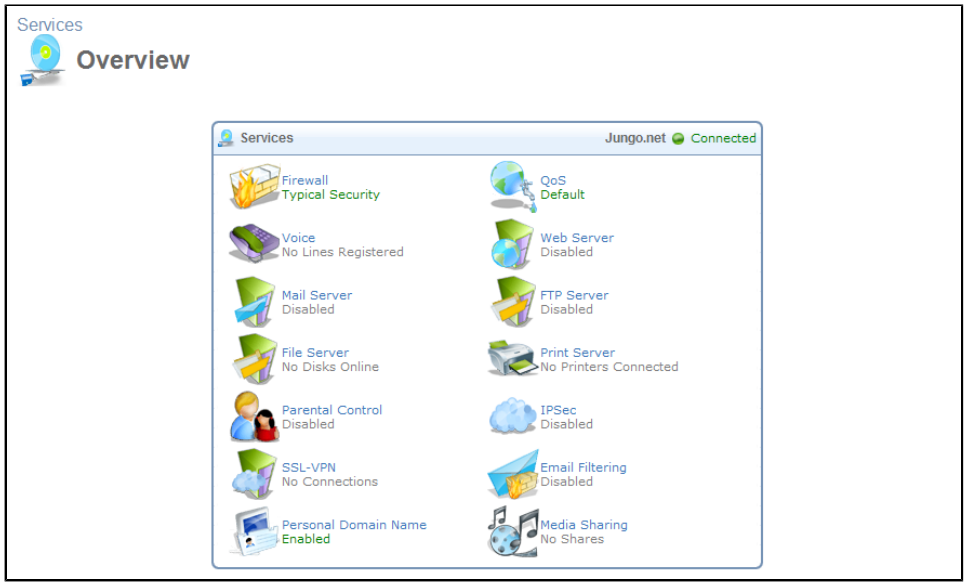

Figure 4.1 Services Overview

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4.2 Securing Your Network with the Firewall

OpenRG's gateway security suite includes comprehensive and robust security services: Stateful Packet Inspection Firewall, user authentication protocols and password protection mechanisms. These features together allow users to connect their computers to the Internet and simultaneously be protected from the security threats of the Internet. The firewall, RG-FW OpenRG™, the cornerstone of your gateway's security suite, has been exclusively tailored to the needs of the residential/office user and has been pre-configured to provide optimum security (see Figure 4.2).

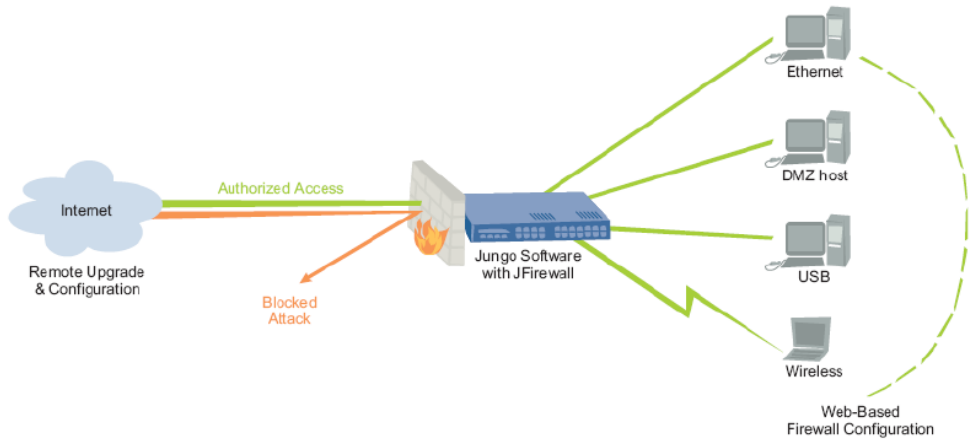

Figure 4.2 OpenRG's Firewall in Action

OpenRG's firewall provides both the security and flexibility that home and office users seek. It provides a managed, professional level of network security while enabling the safe use of interactive applications, such as Internet gaming and video-conferencing.

Additional features, including browsing restrictions and access control, can also be easily configured locally by the user through a user-friendly Web-based interface, or remotely by a service provider. The OpenRG firewall supports advanced filtering, designed to allow comprehensive control over the firewall's behavior. You can define specific input and output rules, control the order of logically similar sets of rules and make a distinction between rules that apply to WAN and LAN network devices.

4.2.1 Configuring Basic Security Settings

The 'General' screen enables you to configure the gateway's basic security settings.

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Figure 4.3 General

You may choose between three pre-defined security levels for OpenRG: Minimum, Typical (the default), and Maximum. The following table summarizes OpenRG's behavior for each of the three security levels.

Security Level	Requests Originating in the WAN (Incoming Traffic)	Requests Originating in the LAN (Outgoing Traffic)
Maximum Security	*Blocked*: No access to home network from Internet, except as configured in the Port Forwarding, DMZ host and Remote Access screens	*Limited*: Only commonly-used services, such as Web-browsing and e-mail, are permitted. The list of allowed services can be edited in the Access Control screen (refer to Section 4.2.2)
Typical Security (Default)	*Blocked*: No access to home network from Internet, except as configured in the Port Forwarding, DMZ host and Remote Access screens	*Unrestricted*: All services are permitted, except as configured in the Access Control screen
Minimum Security	*Unrestricted*: Permits full access from Internet to home network; all connection attempts permitted	*Unrestricted*: All services are permitted, except as configured in the Access Control screen

Table 4.1 OpenRG's Firewall Security Levels

To configure OpenRG's basic security settings, perform the following:

1. Choose between the three predefined security levels described in the table above.

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Note: Using the *Minimum Security* setting may expose the home network to significant security risks, and thus should only be used, when necessary, for short periods of time.

2. Check the 'Block IP Fragments' box in order to protect your home network from a common type of hacker attack that could make use of fragmented data packets to sabotage your home network. Note that VPN over IPSec and some UDP-based services make legitimate use of IP fragments. In case of enabling these services, you will need to allow IP fragments to pass into the home network.

3. Click 'OK' to save the settings.

By default, the selected security level is applied on such services as Telnet, FTP, HTTP, HTTPS, DNS, IMAP, POP3 and SNTP. Note that some applications (such as some Internet messengers and Peer-To-Peer client applications) tend to use ports of the above-mentioned services, if these applications cannot connect using their own default ports. When allowing this behavior, the applications' outbound connection requests will not be blocked, even at the Maximum Security level.

After the security level is set, the firewall regulates the flow of data between the home network and the Internet. Both incoming and outgoing data are inspected and then either accepted (allowed to pass through OpenRG) or rejected (barred from passing through OpenRG), according to a flexible and configurable set of rules. These rules are designed to prevent unwanted intrusions from the outside, while allowing home users access to the Internet services that they require.

The firewall rules specify what types of services available on the Internet may be accessed from the home network and what types of services available in the home network may be accessed from the Internet. Each request for a service that the firewall receives, whether originating from the Internet or from a computer in the home network, is checked against the set of firewall rules to determine whether the request should be allowed to pass through the firewall. If the request is permitted to pass, then all subsequent data associated with this request (a "session") will also be allowed to pass, regardless of its direction.

For example, when you point your browser to a Web page, a request is sent out to the Internet for retrieving and loading this page. When the request reaches OpenRG, the firewall identifies the request's type and origin—HTTP and a specific PC in your home network, in this case. Unless you have configured access control to block requests of this type from this computer, the firewall will allow this request to pass out onto the Internet (refer to Section 4.2.2 for more on setting OpenRG's access control).

When the Web page is returned from the Web server, the firewall associates it with this session and allows it to pass, regardless of whether HTTP access from the Internet to the home network is blocked or permitted. It is the *origin of the request*, not the subsequent responses to this request, that determines whether a session can be established or not.

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4.2.2 Controlling Access to Internet Services

You may want to block specific computers within the home network (or even the whole network) from accessing certain services on the Internet. For example, you may want to prohibit one computer from browsing the Web, another computer from transferring files using FTP, and the whole network from receiving e-mail (by blocking the *outgoing* requests to POP3 servers on the Internet). The 'Access Control' screen enables you to define restrictions on the types of requests that may pass from the home network out to the Internet, and thus may block traffic flowing in both directions. It can also be used for allowing specific services when maximum security is configured.

- To allow or restrict services:

1. Click 'Access Control' under the 'Firewall' menu item. The 'Access Control' screen appears.

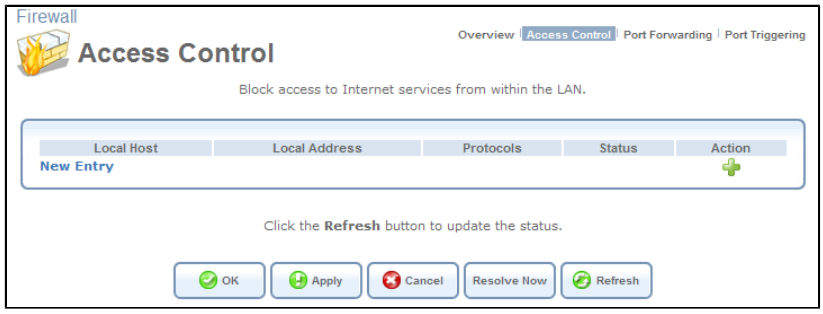

Figure 4.4 Access Control

2. Click the 'New Entry' link. The 'Add Access Control Rule' screen appears.

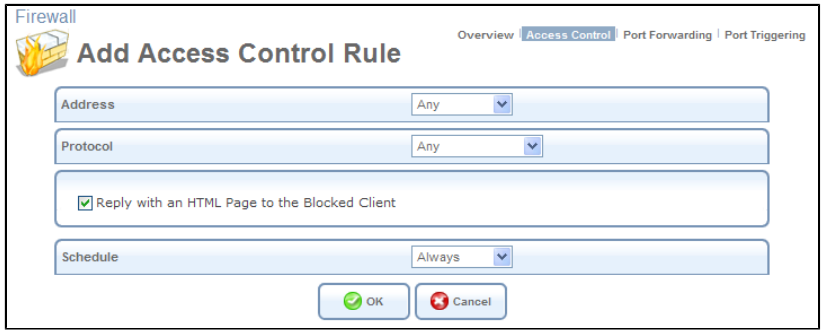

Figure 4.5 Add Access Control Rule

3. The 'Address' drop-down menu enables you to specify the computer or group of computers on which you would like to apply the access control rule. Select an address or a name from the list to apply the rule on the corresponding host, or 'Any' to apply the rule on all OpenRG's LAN hosts. If you would like to add a new address, select the 'User Defined' option in the drop-down menu. This will commence a sequence that will add a new **Network Object**, representing the new host.

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4. The 'Protocol' drop-down menu enables you to select or specify the type of protocol that will be used. Selecting the 'Show All Services' option expands the list of available protocols. Select a protocol or add a new one using the 'User Defined' option. This will commence a sequence that will add a new **Service**, representing the protocol.

5. Select the 'Reply an HTML page to the blocked client' check box to display the following message to the client: "Access Denied – this computer is not allowed to surf the WAN. Please contact your admin.". When this check box is deselected, the client's packets are simply ignored and no notification is issued.

6. By default, the rule will always be active. However, you can define time segments during which the rule may be active, by selecting 'User Defined' from the 'Schedule' drop-down menu. If more than one scheduler rule is defined, the 'Schedule' drop-down menu will allow you to choose between the available rules. To learn how to configure scheduler rules, refer to the 'Defining Scheduler Rules' section of the OpenRG Administrator Manual.

7. Click 'OK' to save your changes. The 'Access Control' screen displays a summary of the rule that you have just added.

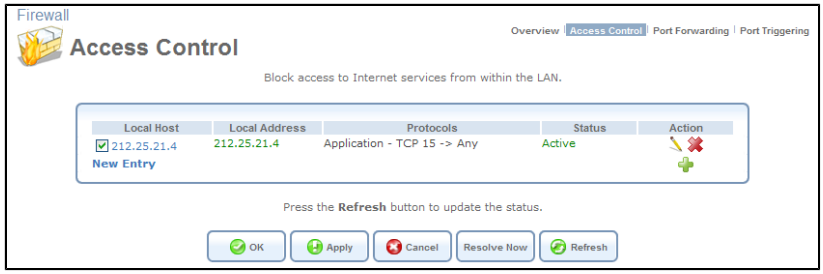

Figure 4.6 Access Control Rule

You may edit the access control rule by modifying its entry displayed under the 'Local Host' column.

- To modify a rule's entry:

1. Click the rule's action icon . The 'Edit Access Control Rule' screen appears. This screen allows you to edit all the parameters that you configured when creating the access control rule.

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Figure 4.7 Edit Access Control Rule

2. Click 'OK' to save your changes and return to the 'Access Control' screen.

You can disable an access control rule in order to make a service available without having to remove the rule from the 'Access Control' screen. This may be useful if you wish to make the service available only temporarily, intending to reinstate the restriction in the future.

- To temporarily disable a rule, clear the check box next to the service name.
- To reinstate it at a later time, simply reselect the check box.
- To remove a rule, click the service's action icon . The service will be permanently removed.

When the 'Maximum' security level is applied, the 'Access Control' screen also displays a list of automatically generated firewall rules that allow access to specific Internet services from the LAN computers, over pre-defined ports.

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Firewall
Access Control
Overview | Access Control | Port Forwarding | Port Triggering
Block or allow access to Internet services from within the LAN.
Blocked
Local Host | Local Address | Protocols | Status | Action
New Entry
Allowed
Local Host | Local Address | Protocols | Status | Action
Any | Any | DHCP - UDP 67-68 -> 67 | Active
Any | Any | DNS - TCP 53 -> 53
TCP 1024-65535 -> 53
UDP 53 -> 53
UDP 1024-65535 -> 53 | Active
Any | Any | IMAP - TCP Any -> 143 | Active
Any | Any | SMTP - TCP Any -> 25 | Active
Any | Any | POP3 - TCP Any -> 110 | Active
Any | Any | HTTPS - TCP Any -> 443 | Active
Any | Any | HTTP - TCP Any -> 80 | Active
Any | Any | FTP - TCP Any -> 21 | Active
Any | Any | Telnet - TCP Any -> 23 | Active
New Entry
Click the Refresh button to update the status.
OK
Apply
Cancel
Resolve Now
Refresh

Figure 4.8 Access Control – Allowed Services in Maximum Security Mode

You can manage these access control rules as well as create new ones (allowing access to other services), as described earlier in this section.

Note: When the Parental Control service is enabled (refer to Section 4.10), HTTP services cannot be blocked by Access Control.

4.2.3 Using Port Forwarding

In its default state, OpenRG blocks all external users from connecting to or communicating with your network. Therefore, the system is safe from hackers who may try to intrude into the network and damage it. However, you may wish to expose your network to the Internet in certain limited and controlled ways. The Port Forwarding feature enables you to do so. If you are familiar with networking terminology and concepts, you may have encountered the port forwarding capability referred to as "Local Servers".

The 'Port Forwarding' screen enables you to define applications (such as Peer-to-Peer, game, voice, chat programs, etc.) that will be allowed a controlled Internet activity. For example, if you wish to use a File Transfer Protocol (FTP) application on one of your PCs, you would simply create a port forwarding rule, which specifies that all FTP-related data arriving at OpenRG from the Internet will henceforth be forwarded to the specified computer.

Similarly, you can grant Internet users access to servers inside your home network, by identifying each service and the PC that will provide it. This is useful, for example, if you would like to host a Web server inside your home network. When an Internet user points a browser to OpenRG's external IP address, the gateway will forward the incoming HTTP request to your Web server, if the corresponding port forwarding rule had been set.

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However, there is a limitation that must be considered. With one external IP address (OpenRG's main IP address), different applications can be assigned to your LAN computers, however each type of application is limited to use one computer. For example, you can define that FTP will use address X to reach computer A and Telnet will also use address X to reach computer A, but attempting to define FTP to use address X to reach both computer A and B will fail. OpenRG therefore provides the ability to add additional public IP addresses to port forwarding rules, which you must first obtain from your ISP, and enter into the 'NAT IP Addresses Pool' (refer to Section 4.2.6). You will then be able to define FTP to use address X to reach computer A, and address Y to reach computer B.

Additionally, port forwarding enables you to redirect traffic to a different port instead of the one for which it was designated. For example, you have a Web server running on your PC on port 8080 and you want to grant access to this server to anyone who accesses OpenRG via HTTP (by default, on port 80). To accomplish this, you will have to define a port forwarding rule for the HTTP service, with the PC's IP or host name, as well as specify 8080 in the 'Forward to Port' field. All incoming HTTP traffic will be forwarded to the PC running the Web server on port 8080.

When setting a port forwarding service, you must ensure that the port is not already in use by another application, which may stop functioning. A common example is when using SIP signaling in Voice over IP—the port used by the gateway's VoIP application (5060) is the same port on which port forwarding is set for LAN SIP agents. For more details, refer to Section 4.5.8.3.

4.2.3.1 Adding a Port Forwarding Rule

To add a new port forwarding rule, perform the following:

1. Click 'Port Forwarding' under the 'Firewall' menu item. The 'Port Forwarding' screen appears.

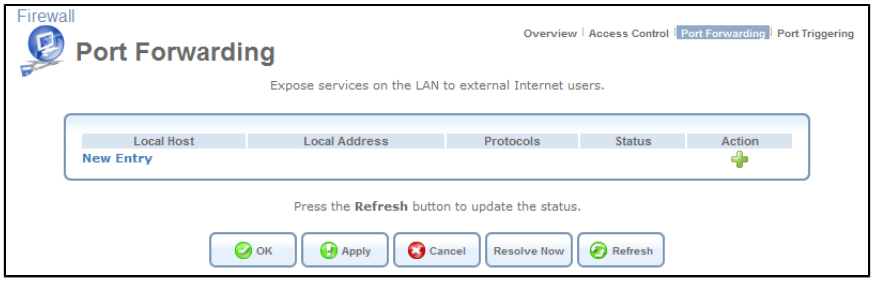

Figure 4.9 Port Forwarding

2. Click the 'New Entry' link. The 'Add Port Forwarding Rule' screen appears.

Figure 4.10 Add Port Forwarding Rule

3. The 'Local Host' drop-down menu lists your available LAN computers. Select a computer that provides the service, to which you wish to grant access over the Internet. Note that unless an additional external IP address has been added, only one LAN computer can be assigned to provide a specific service or application.

4. The 'Protocol' drop-down menu enables you to select or specify the type of protocol that will be used. Selecting the 'Show All Services' option expands the list of available protocols. Select a protocol or add a new one using the 'User Defined' option. This will commence a sequence that will add a new **Service**, representing the protocol.

5. When creating a port forwarding rule, you must ensure that the port used by the selected protocol is not already in use by any other of your local services, which, in this case, may stop functioning. A common example is when using SIP signaling in Voice over IP—the port used by the gateway's VoIP application (5060) is the same port on which port forwarding is set for LAN SIP agents. For more details, refer to Section 4.5.8.3.

6. If you would like to apply this rule on OpenRG's non-default IP address (which you can define in the 'NAT' screen, as described in Section 4.2.6), perform the following:

   a. Select the 'Specify Public IP Address' check box. The screen refreshes.

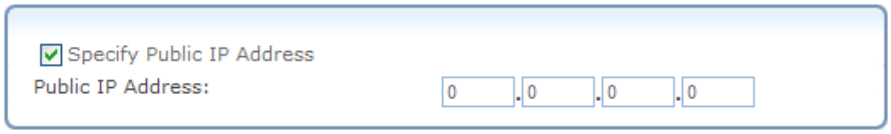

Figure 4.11 Specify Public IP Address

   b. Enter the additional external IP address in the 'Public IP Address' field.

7. By default, the rule will always be active. However, you can define time segments during which the rule may be active, by selecting 'User Defined' from the 'Schedule' drop-down menu. If more than one scheduler rule is defined, the 'Schedule' drop-down menu will allow you to choose between the available rules. To learn how to configure scheduler rules, refer to the 'Defining Scheduler Rules' section of the OpenRG Administrator Manual.

8. Click 'OK' to save your changes. The 'Port Forwarding' screen displays a summary of the rule that you have just added.

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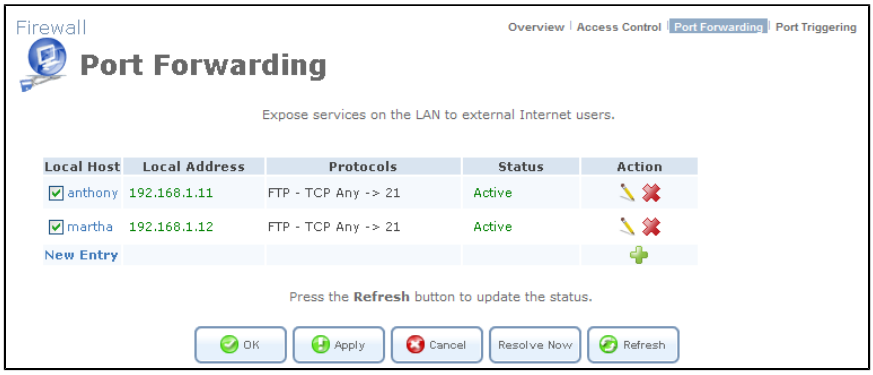

Figure 4.12 Port Forwarding Rule

You may edit the port forwarding rule by clicking its entry under the 'Local Host' column in the 'Port Forwarding' screen. You can also disable the rule in order to make a service unavailable without having to remove the rule from the 'Port Forwarding' screen. This may be useful if you wish to make the service unavailable only temporarily, intending to reinstate it in the future.

- To temporarily disable a rule, clear the check box next to the service name.
- To reinstate it at a later time, simply reselect the check box.
- To remove a rule, click the service's action icon . The service will be permanently removed.

All the computers in the local network can simultaneously use a specific service as clients. Being a client means that the computer within the network initiates the connection—for example, opens an FTP connection with an FTP server on the Internet. However, only one computer can serve as a server, responding to requests from computers on the Internet.

4.2.4 Using Port Triggering

Port triggering is used for setting a dynamic port forwarding configuration. By setting port triggering rules, you can allow inbound traffic to arrive at a specific LAN host, using ports different than those used for the outbound traffic. This is called port triggering since the outbound traffic triggers to which ports inbound traffic is directed.

For example, consider a gaming server that is accessed using the UDP protocol on port 2222. The gaming server responds by connecting the user using UDP on port 3333, when starting gaming sessions. In such a case you must use port triggering, since this scenario conflicts with the following default firewall settings:

- The firewall blocks inbound traffic by default.
- The server replies to OpenRG's IP, and the connection is not sent back to your host, since it is not part of a session.

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In order to solve this, you need to define a Port Triggering entry, which allows inbound traffic on UDP port 3333 only after a LAN host generated traffic to UDP port 2222. To do so, perform the following:

1. Click the 'Port Triggering' link under the 'Firewall' menu item. The 'Port Triggering' screen appears. This screen will list all of the port triggering entries.

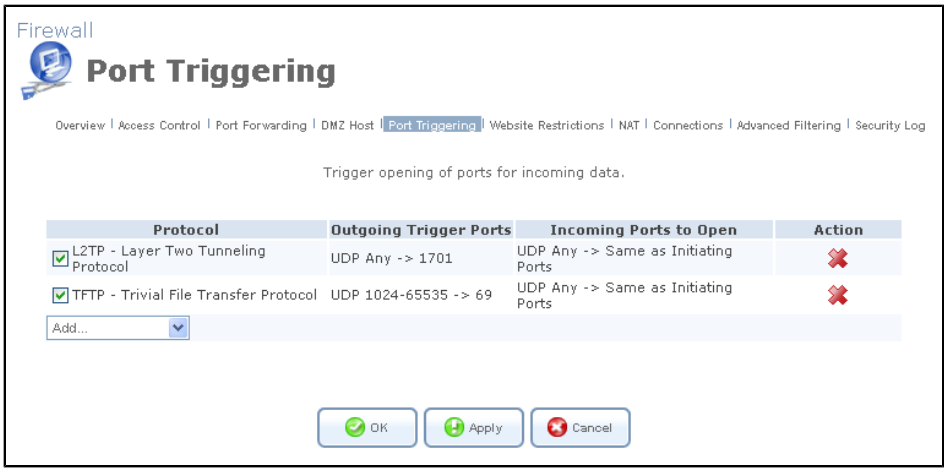
Firewall
Port Triggering
Overview | Access Control | Port Forwarding | DMZ Host | Port Triggering | Website Restrictions | NAT | Connections | Advanced Filtering | Security Log
Trigger opening of ports for incoming data.
Protocol
Outgoing Trigger Ports
Incoming Ports to Open
Action
L2TP - Layer Two Tunneling Protocol
UDP Any -> 1701
UDP Any -> Same as Initiating Ports
TFTP - Trivial File Transfer Protocol
UDP 1024-65535 -> 69
UDP Any -> Same as Initiating Ports
Add...
OK
Apply
Cancel

Figure 4.13 Port Triggering

2. Select the 'User Defined' option to add an entry. The 'Edit Port Triggering Rule' screen appears.

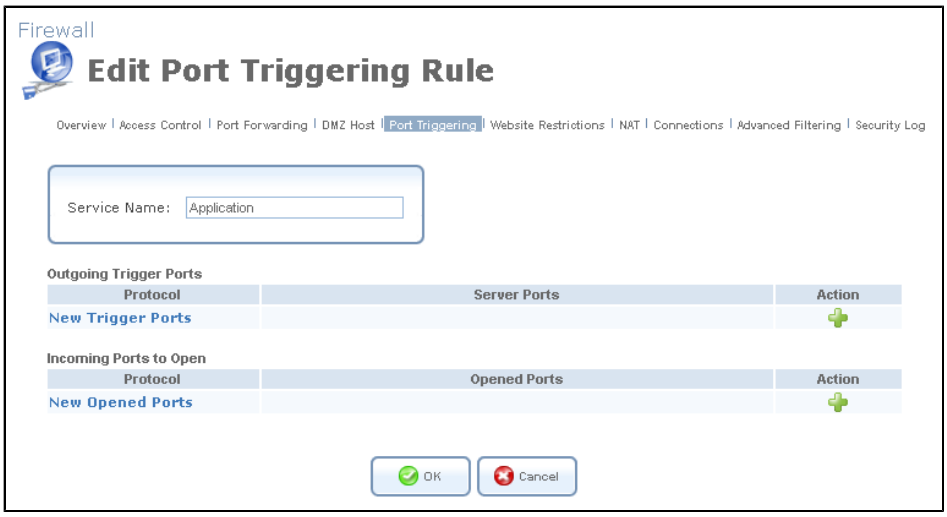

Figure 4.14 Edit Port Triggering Rule

3. Enter a name for the service (e.g. "game_server"), and click the 'New Trigger Ports' link. The 'Edit Service Server Ports' screen appears.

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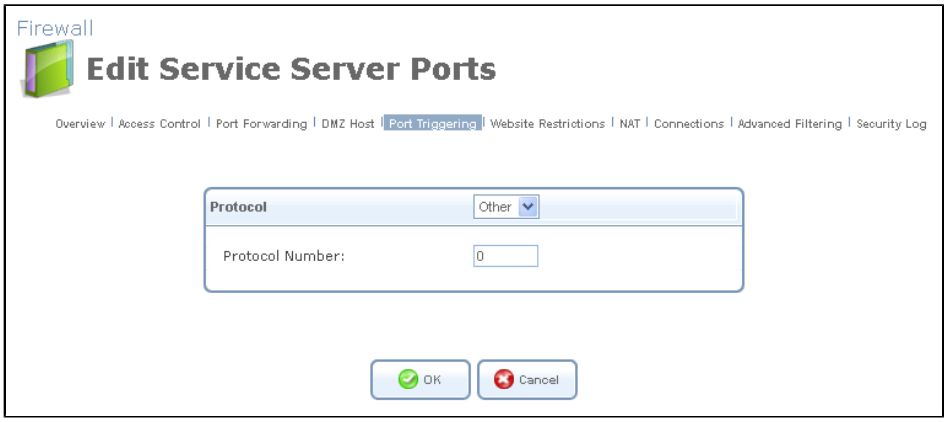
Firewall
Edit Service Server Ports
Overview | Access Control | Port Forwarding | DMZ Host | Port Triggering | Website Restrictions | NAT | Connections | Advanced Filtering | Security Log
Protocol
Other
Protocol Number:
0
OK
Cancel

Figure 4.15 Edit Service Server Ports

4. From the 'Protocol' drop-down menu, select 'UDP'. The screen will refresh, providing source and destination port options (see Figure 4.16).

5. Leave the 'Source Ports' drop-down menu at its default "Any". From the 'Destination Ports' drop-down menu, select "Single". The screen will refresh again, providing an additional field in which you should enter "2222" as the destination port.

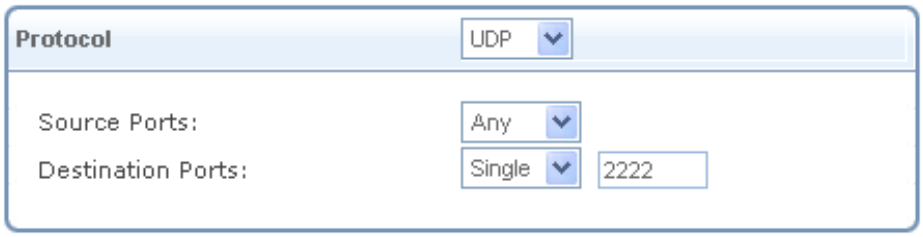

Figure 4.16 Edit Service Server Ports

6. Click 'OK' to save the settings.

7. Back in the 'Edit Port Triggering Rule' screen (see Figure 4.14), click the 'New Opened Ports' link. The 'Edit Service Opened Ports' screen appears.

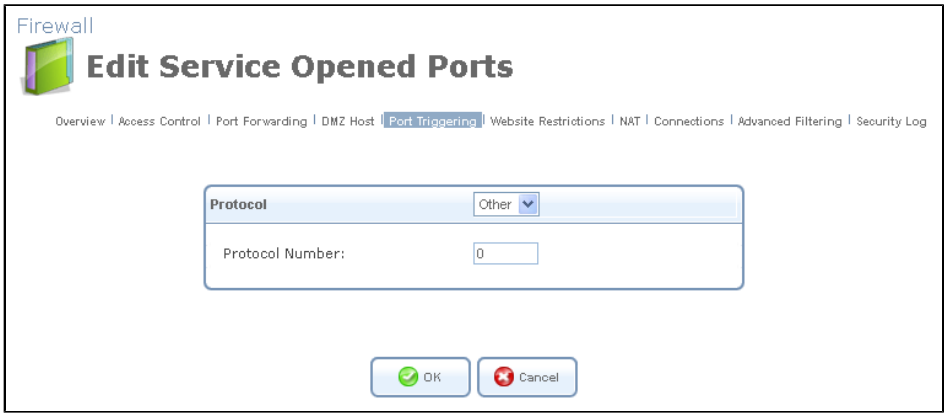
Firewall
Edit Service Opened Ports
Overview | Access Control | Port Forwarding | DMZ Host | Port Triggering | Website Restrictions | NAT | Connections | Advanced Filtering | Security Log
Protocol
Other
Protocol Number:
0
OK
Cancel

Figure 4.17 Edit Service Opened Ports

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8. Select UDP as the protocol, leave the source port at "Any", and enter a 3333 as the single destination port.

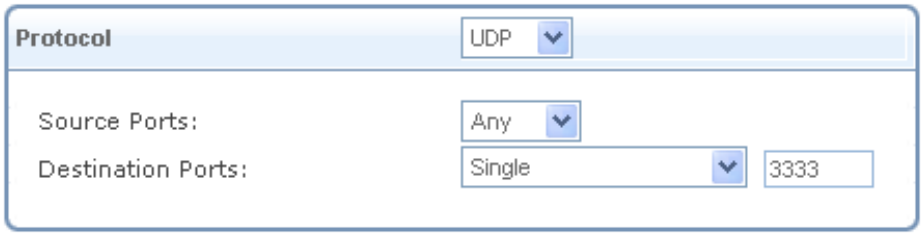

Figure 4.18 Edit Service Opened Ports

9. Click 'OK' to save the settings. The 'Edit Service' screen will present your entered information. Click 'OK' again to save the port triggering rule. The 'Port Triggering' screen will now include the new port triggering entry.

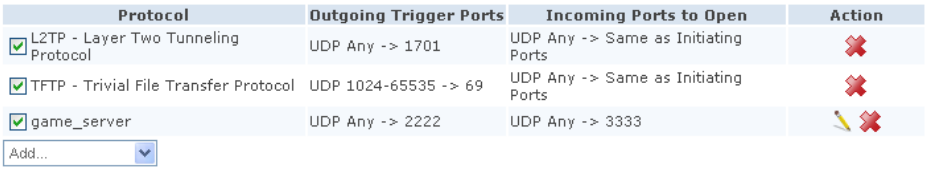

Figure 4.19 New Port Triggering Rule

This will result in accepting the inbound traffic from the gaming server, and sending it back to the LAN Host which originated the outgoing traffic to UDP port 2222.

- To temporarily disable a rule, clear the check box next to the service name.
- To reinstate it at a later time, simply reselect the check box.
- To remove a rule, click the service's action icon . The service will be permanently removed.

Note: There may be a few default port triggering rules listed when you first access the port triggering screen. Disabling these rules may result in impaired gateway functionality.

4.2.5 Restricting Web Access

You can configure OpenRG to block specific websites so that they cannot be accessed from computers in the home network. Moreover, restrictions can be applied according to a comprehensive and automatically updated list of sites to which access is not recommended.

- To block access to a website:

1. Click the 'Website Restrictions' link under the 'Firewall' menu item.

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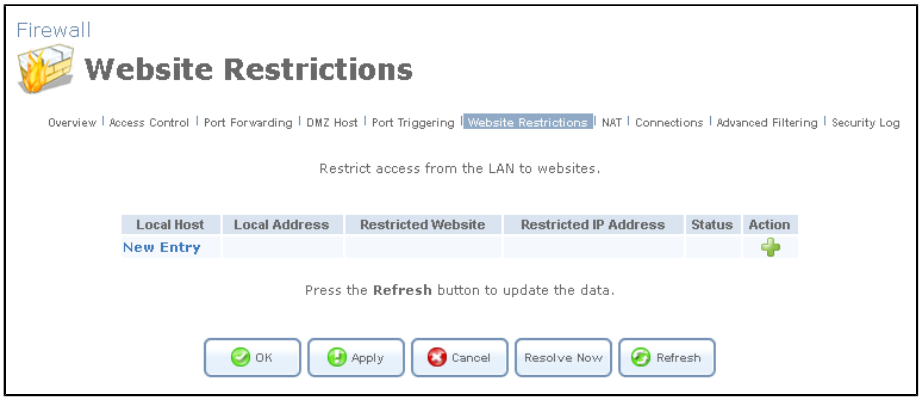

Figure 4.20 Website Restrictions

2. Click the 'New Entry' link. The 'Restricted Website' screen appears.

Firewall
Restricted Website
Overview | Access Control | Port Forwarding | DMZ Host | Port Triggering | Website Restrictions | NAT | Connections | Advanced Filtering | Security Log
Enter the website you wish to restrict:
Restricted Website:
Local Host
Any
Schedule
Always
OK
Cancel

Figure 4.21 Restricted Website

3. Enter the URL (or part of the URL) that you would like to make inaccessible from your home network (all web pages within this URL will also be blocked). If the URL has multiple IP addresses, OpenRG will resolve all additional addresses and automatically add them to the restrictions table.

4. The 'Local Host' drop-down menu provides you with the ability to specify the computer or group of computers on which you would like to apply the website restriction. Select an address or a name from the list to apply the rule on the corresponding host, or 'Any' to apply the rule on all OpenRG's LAN hosts. If you would like to add a new address, select the 'User Defined' option in the drop-down menu. This will commence a sequence that will add a new **Network Object**, representing the new host.

5. By default, the rule will always be active. However, you can define time segments during which the rule may be active, by selecting 'User Defined' from the 'Schedule' drop-down menu. If more than one scheduler rule is defined, the 'Schedule' drop-down menu will allow you to choose between the available rules. To learn how to configure scheduler rules, refer to the 'Defining Scheduler Rules' section of the OpenRG Administrator Manual.

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6. Click 'OK' to save the settings. You will be returned to the previous screen, while OpenRG attempts to find the site. 'Resolving...' will appear in the 'Status' column while the site is being located (the URL is 'resolved' into one or more IP addresses).

7. Click the 'Refresh' button to update the status if necessary. If the site is successfully located, then 'Resolved' will appear in the status bar. Otherwise, 'Hostname Resolution Failed' will appear. In case OpenRG fails to locate the website, perform the following:

    a. Use a web browser to verify that the website is available. If it is, then you probably entered the website address incorrectly.

    b. If the website is not available, return to the 'Website Restrictions' screen at a later time and click the 'Resolve Now' button to verify that the website can be found and blocked by OpenRG.

You may edit the website restriction by modifying its entry under the 'Local Host' column in the 'Website Restrictions' screen.

- To modify an entry:

    1. Click the action icon for the restriction. The 'Restricted Website' screen appears (see Figure 4.21). Modify the website address, group or schedule as necessary.

    2. Click the 'OK' button to save your changes and return to the 'Website Restrictions' screen.

- To ensure that all current IP addresses corresponding to the restricted websites are blocked, click the 'Resolve Now' button. OpenRG will check each of the restricted website addresses and ensure that all IP addresses at which this website can be found are included in the IP addresses column.

  You can disable a restriction in order to make a website available again without having to remove it from the 'Website Restrictions' screen. This may be useful if you wish to make the website available only temporarily, intending to block it again in the future.

- To temporarily disable a rule, clear the check box next to the service name.

- To reinstate it at a later time, simply reselect the check box.

- To remove a rule, click the service's action icon . The service will be permanently removed.

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4.2.6 Using OpenRG's Network Address and Port Translation

OpenRG features a configurable Network Address Translation (NAT) and Network Address Port Translation (NAPT) mechanism, allowing you to control the network addresses and ports set in packets routed through your gateway. When enabling multiple computers on your network to access the Internet using a fixed number of public IP addresses, you can statically define which LAN IP address will be translated to which NAT IP address and/or ports.

By default, OpenRG operates in NAPT routing mode. However, you can control your network translation by defining static NAT/NAPT rules. Such rules map LAN computers to NAT IP addresses. The NAT/NAPT mechanism is useful for managing Internet usage in your LAN, or complying with various application demands. For example, you can assign your primary LAN computer a single NAT IP address, in order to assure its permanent connection to the Internet. Another example is when an application server to which you would like to connect, such as a security server, requires that packets have a specific IP address—you can define a NAT rule for that address.

4.2.6.1 Configuring the NAT

Click the 'NAT' link under the 'Firewall' menu item. The 'NAT' screen appears.

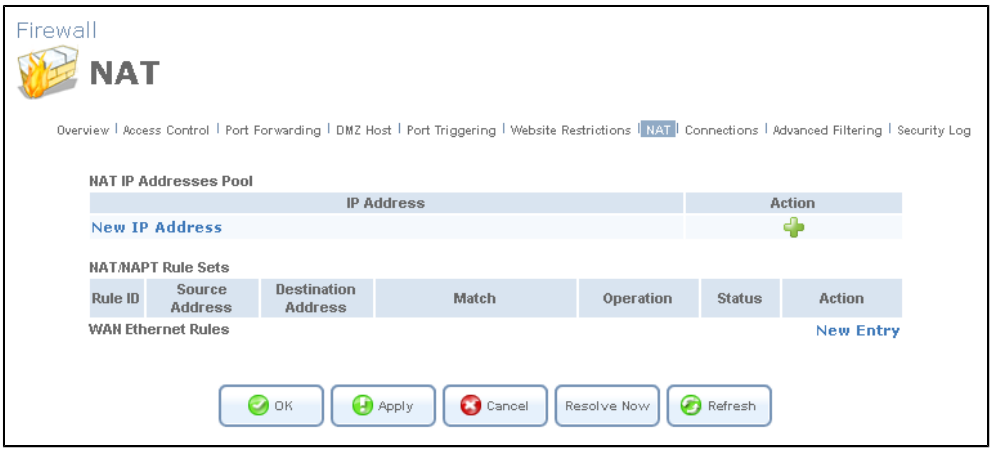

Figure 4.22 Network Address Translation

Before configuring NAT/NAPT rules, you must first enter the additional public IP addresses obtained from your ISP as your NAT IP addresses, in the 'NAT IP Addresses Pool' section.

Note: The primary IP address used by the WAN device for dynamic NAPT should not be added to this table.

To add a NAT IP address, perform the following:

1. Click the 'New IP Address' link. The 'Edit Item' screen appears.

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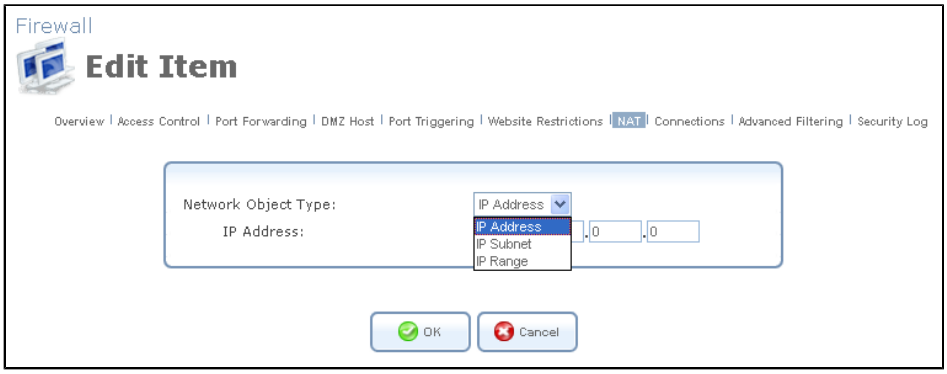
Firewall
Edit Item
Overview | Access Control | Port Forwarding | DMZ Host | Port Triggering | Website Restrictions | NAT | Connections | Advanced Filtering | Security Log
Network Object Type:
IP Address:
IP Address
IP Subnet
IP Range
OK
Cancel

Figure 4.23 Edit Item

2. To add a single public address, select the 'IP Address' option from the 'Network Object Type' drop-down menu, and enter the IP in the fields that appear.

Figure 4.24 Edit Item

To add a range of public IP addresses, select the 'IP Range' option and enter the available IP range.

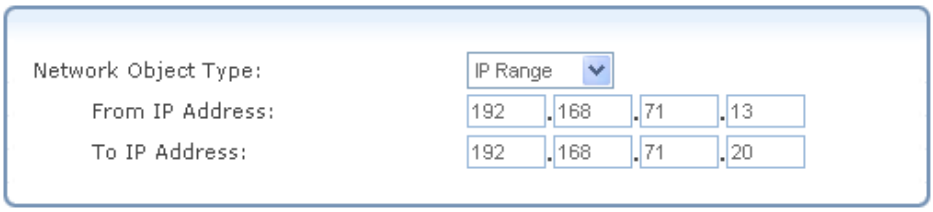

Figure 4.25 Edit Item

3. Click 'OK' to save the settings. The new IP addresses are displayed in the 'NAT IP Addresses Pool' section.

Figure 4.26 NAT IP Addresses

To add a new NAT/NAPT rule, click the 'New Entry' link in the 'NAT/NAPT Rule Sets' section of the 'NAT' screen. The 'Add NAT/NAPT Rule' screen appears.

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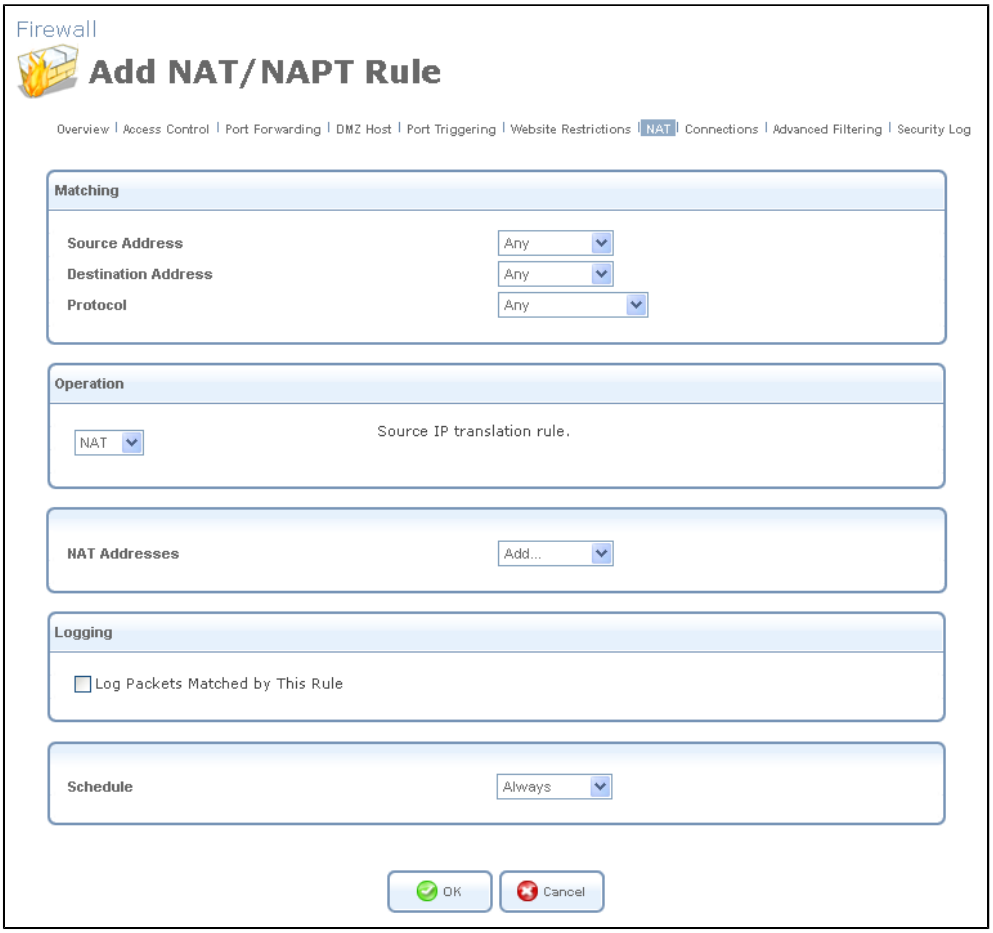

Figure 4.27 Add NAT/NAPT Rule

Matching Use this section to define characteristics of the packets matching the rule.

- **Source Address** The source address of packets sent or received by OpenRG. Use this drop-down menu to specify a LAN computer or a group of LAN computers on which you would like to apply the rule. Select an address or a name from the list to apply the rule on the corresponding host, or 'Any' to apply the rule on all OpenRG's LAN hosts. If you would like to add a new address, select the 'User Defined' option in the drop-down menu. This will commence a sequence that will add a new **Network Object**, representing the new host.

- **Destination Address** The destination address of packets sent or received by OpenRG. This address can be configured in the same manner as the source address. For example, use this drop-down menu to specify an IP address of a remote application server (such as a security server), which requires that the incoming packets have a specific IP address (e.g., one of those defined in your NAT IP address pool).

- **Protocol** You may also specify a traffic protocol. Selecting the 'Show All Services' option from the drop-down menu expands the list of available protocols. Select a protocol or add a new one using the 'User Defined' option. This will commence a sequence that will add a new **Service**, representing the protocol.

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Operation Use this section to define the operation that will be applied on the IP addresses matching the criteria defined above. The operations available are NAT or NAPT. Selecting each from the drop-down menu refreshes the screen accordingly.

- **NAT Addresses**

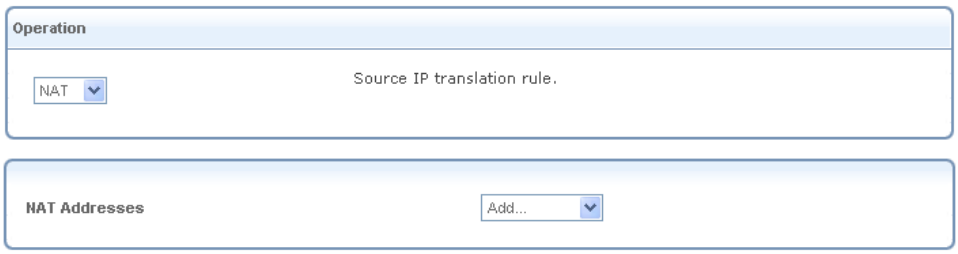

Figure 4.28 Add NAT Rule

This drop-down menu displays all of your available NAT addresses/ranges, from which you can select an entry. If you would like to add a single address or a sub-range from the given pool/range, select the 'User Defined' option in the drop-down menu. This will commence a sequence that will add a new **Network Object**, representing the new host.

- **NAPT Address**

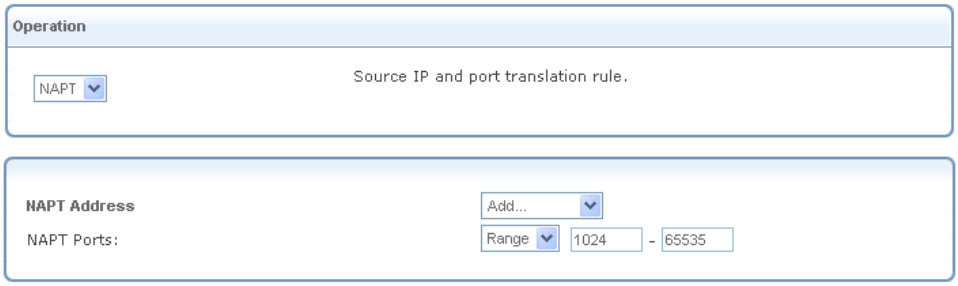

Figure 4.29 Add NAPT Rule

This drop-down menu displays all of your available NAPT addresses/ranges, from which you can select an entry. If you would like to add a single address or a sub-range from the given pool/range, select the 'User Defined' option from the drop-down menu. This will commence a sequence that will add a new **Network Object**, representing the new host. Note, however, that in this case the network object may only be an IP address, as NAPT is port-specific.

- **NAPT Ports** Specify the port(s) for the IP address into which the original IP address will be translated. Enter a single port or select 'Range' in the drop-down menu. The screen refreshes, enabling you to enter a range of ports.

Figure 4.30 Add NAPT Rule

Logging Monitor the rule.

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- **Log Packets Matched by This Rule** Select this check box to log the first packet from a connection that was matched by this rule.

Schedule By default, the rule will always be active. However, you can define time segments during which the rule may be active, by selecting 'User Defined' from the 'Schedule' drop-down menu. If more than one scheduler rule is defined, the 'Schedule' drop-down menu will allow you to choose between the available rules. To learn how to configure scheduler rules, refer to the 'Defining Scheduler Rules' section of the OpenRG Administrator Manual.

4.2.6.2 NAT/NAPT Configuration Examples

This section demonstrates the NAT/NAPT usage and capabilities, by creating several rules and observing their implementation. In the following examples, the LAN IP address range is 192.168.1.5 through 192.168.1.25. The NAT addresses are 192.168.71.12 through 192.168.71.20, and they have been entered to the NAT address pool as described earlier.

In the 'NAT' screen, click the 'New Entry' link in the 'NAT/NAPT Rule Sets' section. The 'Add NAT/NAPT Rule' screen appears.

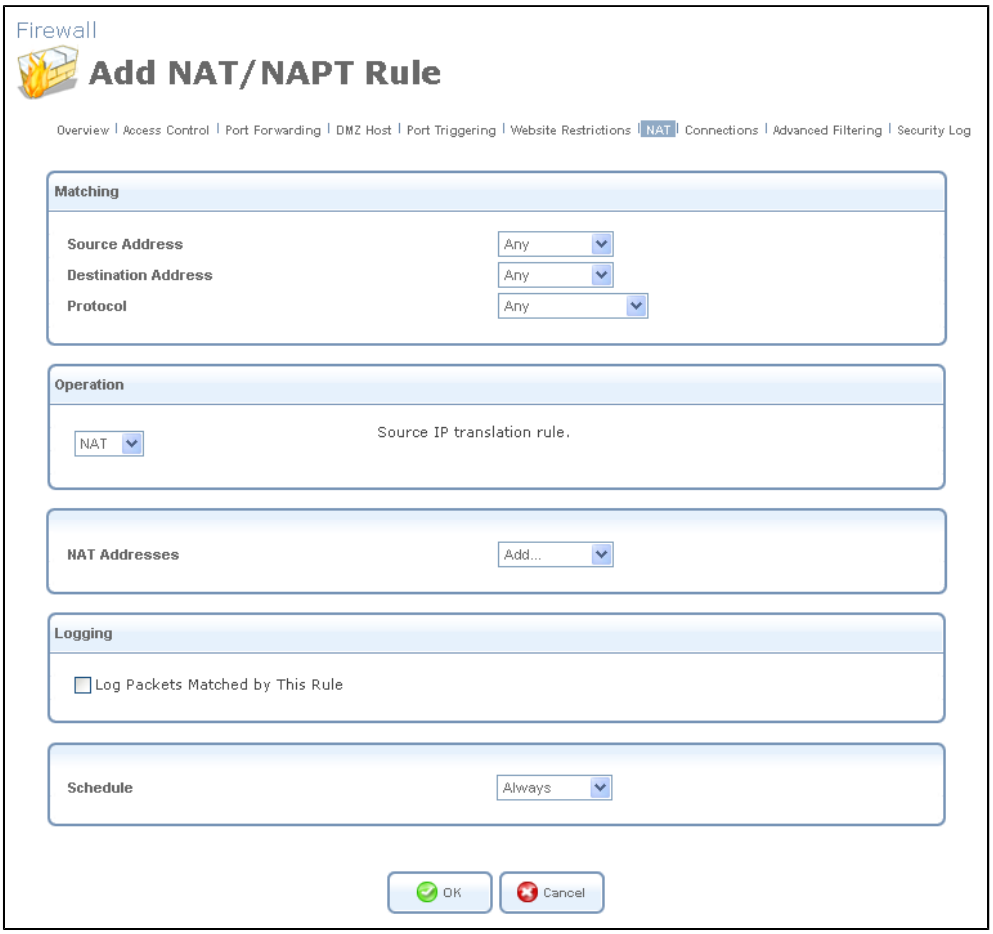

Figure 4.31 Add NAT/NAPT Rule

Create the following NAT/NAPT rules:

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1. Translate the address 192.168.1.10 to 192.168.71.12. In this example, LAN addresses (192.168.1.X) are not defined yet, therefore do not appear as drop-down menu options, and network objects must be created in order to represent them.

   a. Select 'User Defined' in the 'Source Address' drop-down menu. The 'Edit Network Object' screen appears.

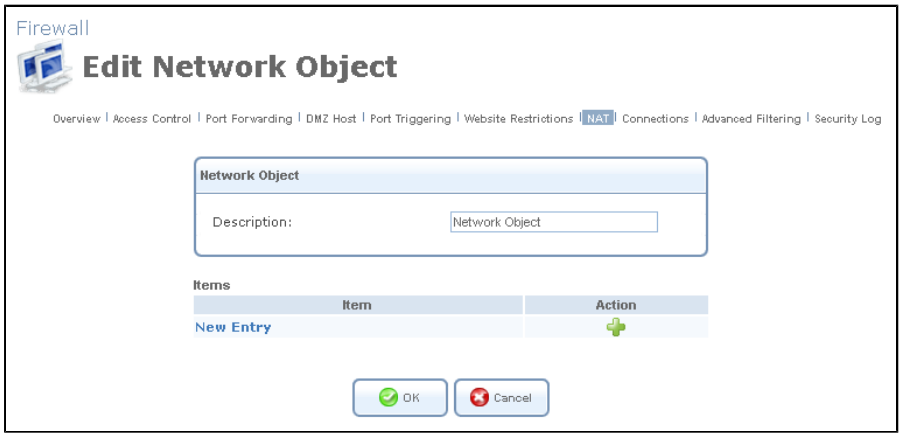

Figure 4.32 Edit Network Object

   b. Click 'New Entry'. The 'Edit Item' screen appears.

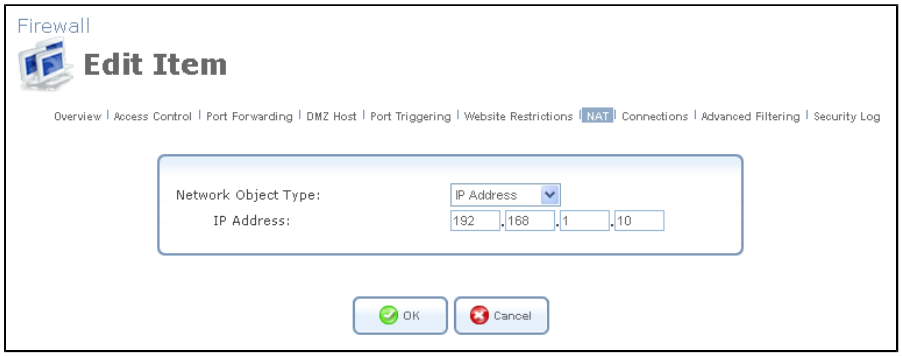

Figure 4.33 Edit Item

   c. Select 'IP Address' in the 'Network Object Type' drop-down menu, and enter 192.168.1.10.

   d. Click 'OK' to save the settings.

   e. Click 'OK' in the 'Edit Network Object' screen.

   f. Back in the 'Add NAT/NAPT Rule' screen, select 192.168.1.10 from the 'Source' drop-down menu.

   g. From the 'NAT Addresses' drop-down menu, select the '192.168.71.12' option. The screen refreshes, adding this address as a NAT IP address.

   h. Click 'OK' to save the settings.

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The NAT rule is displayed in the 'NAT' screen.

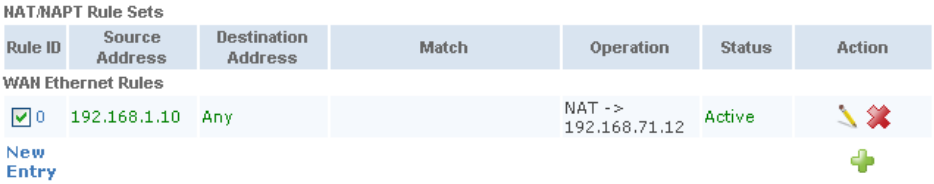

Figure 4.34 NAT/NAPT Rule Sets

This rule translates one LAN IP address to one NAT IP address, meaning that this LAN computer will have WAN access at any time. The status is therefore set to "Active".

2. Translate the range 192.168.1.11-192.168.1.15 to 192.168.71.12-192.168.71.15. Define this NAT rule in the same manner depicted above, with the exception of selecting 'IP Range' (instead of 'IP Address') as the network object type. Since both ranges are not predefined (no such drop-down menu options), network objects must be created in order to represent them, using the 'User Defined' option in the 'Source' and 'NAT' drop-down menus respectively. The created rule is displayed in the 'NAT' screen.

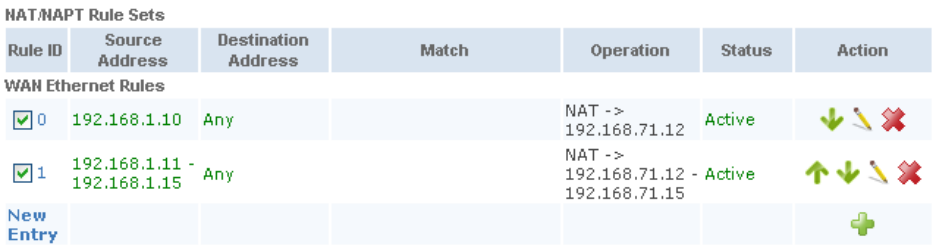

Figure 4.35 NAT/NAPT Rule Sets

This rule translates five new LAN IP addresses to four NAT IP addresses, which would normally mean that only four of the five LAN computers may have WAN access at the same time. However, note that the NAT address 192.168.71.12 is already in use by the first rule. OpenRG will therefore allow these five LAN computers to use only the three remaining IP addresses ending with 71.13, 71.14 and 71.15. The status is therefore set to "Active".

3. Translate the range 192.168.1.21-192.168.1.25 to 192.168.71.13-192.168.71.14. Define this NAT rule in the same manner depicted above. The following attention message is displayed.

Figure 4.36 Attention

Click 'OK'. The rule is displayed in the 'NAT' screen.

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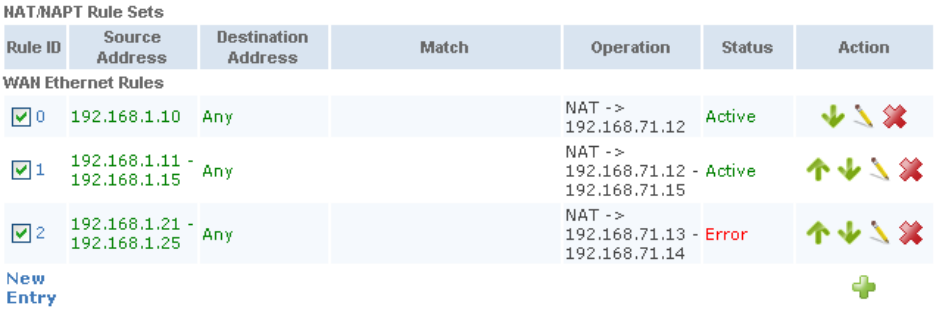
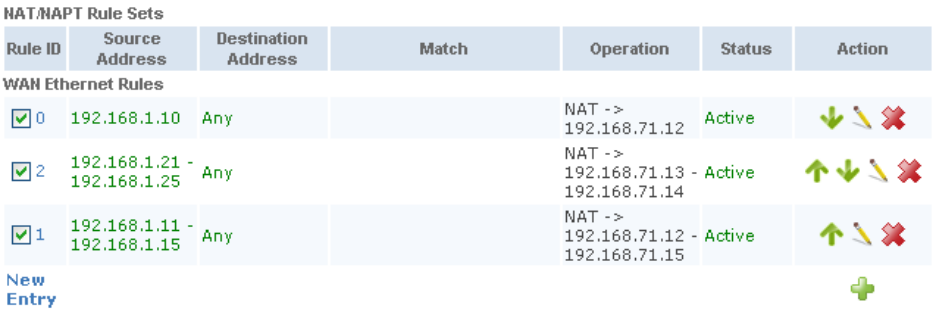


NAT/NAPT Rule Sets

Rule ID	Source Address	Destination Address	Match	Operation	Status	Action
WAN Ethernet Rules						
0	192.168.1.10	Any		NAT -> 192.168.71.12	Active	
1	192.168.1.11 - 192.168.1.15	Any		NAT -> 192.168.71.12 - 192.168.71.15	Active	
2	192.168.1.21 - 192.168.1.25	Any		NAT -> 192.168.71.13 - 192.168.71.14	Error	
New Entry						

Figure 4.37 NAT/NAPT Rule Sets

This rule translates five new LAN IP addresses to two NAT IP addresses, both of which are already in use by the second rule. OpenRG is therefore unable to resolve this situation and the rule's status is set to "Error". Notice that had this rule been defined as the second rule, all three rules would be valid. This is because the NAT address 192.168.71.15 would still be available for rule number 1. This can easily be amended: you can use the green arrow icons to move a rule entry up or down, changing its priority respectively. Click this rule's action icon once. All rules will now be set to "Active".



NAT/NAPT Rule Sets

Rule ID	Source Address	Destination Address	Match	Operation	Status	Action
WAN Ethernet Rules						
0	192.168.1.10	Any		NAT -> 192.168.71.12	Active	
2	192.168.1.21 - 192.168.1.25	Any		NAT -> 192.168.71.13 - 192.168.71.14	Active	
1	192.168.1.11 - 192.168.1.15	Any		NAT -> 192.168.71.12 - 192.168.71.15	Active	
New Entry						

Figure 4.38 NAT/NAPT Rule Sets

Note: The first rule now maps five LAN addresses to one NAT address. OpenRG subtracts all previously used NAT addresses, requested by previous rules, from the requested NAT addresses of the current rule. The requested range of addresses does not determine how many will be available; the number of available addresses is determined by previous rules configuration and order. Rules will appear as "Active" even if they only have one usable NAT address.

4. Translate the address 192.168.1.5 to 192.168.71.16 **ports** 1024-1050. Define this NAPT rule in the same manner depicted above, with the following exception:

    a. Select the 'NAPT' option in the 'Operation' section drop-down menu. The screen refreshes.

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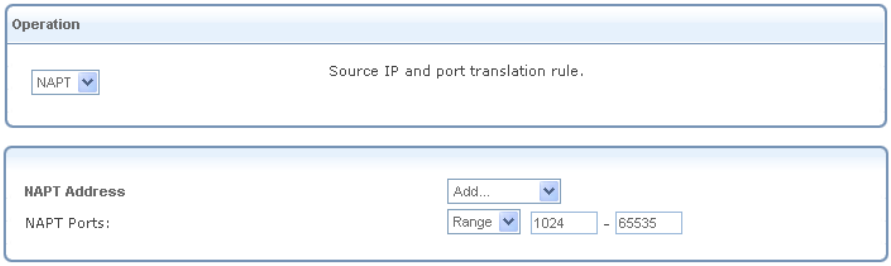

Figure 4.39 Add NAPT Rule

b. Add a NAPT address by selecting the 'User Defined' option.

c. Enter 1024-1050 as the range of ports in the 'NAPT Ports' section.

d. Click 'OK' to save the settings.

The rule is displayed in the 'NAT' screen.

NAT/NAPT Rule Sets

Rule ID	Source Address	Destination Address	Match	Operation	Status	Action
WAN Ethernet Rules						
0	192.168.1.10	Any		NAT -> 192.168.71.12	Active	
2	192.168.1.21 - 192.168.1.25	Any		NAT -> 192.168.71.13 - 192.168.71.14	Active	
1	192.168.1.11 - 192.168.1.15	Any		NAT -> 192.168.71.12 - 192.168.71.15	Active	
3	192.168.1.5	Any		NAPT -> 192.168.71.16 ports 1024-1050	Active	
New Entry						

Figure 4.40 NAT/NAPT Rule Sets

This rule translates a LAN IP address to a NAT IP address with specific ports. Its status is set to "Active".

5. Translate the address 192.168.1.6 to 192.168.71.16 ports 1024-1100. Define this NAPT rule in the same manner depicted above. The rule is displayed in the 'NAT' screen.

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NAT/NAPT Rule Sets

Rule ID	Source Address	Destination Address	Match	Operation	Status	Action
WAN Ethernet Rules						
0	192.168.1.10	Any		NAT -> 192.168.71.12	Active	
2	192.168.1.21 - 192.168.1.25	Any		NAT -> 192.168.71.13 - 192.168.71.14	Active	
1	192.168.1.11 - 192.168.1.15	Any		NAT -> 192.168.71.12 - 192.168.71.15	Active	
3	192.168.1.5	Any		NAPT -> 192.168.71.16 ports 1024-1050	Active	
4	192.168.1.6	Any		NAPT -> 192.168.71.16 ports 1024-1100	Active	
New Entry						

Figure 4.41 NAT/NAPT Rule Sets

This rule translates a LAN IP address to a NAT IP address with ports 1024-1100. However, only ports 1051-1100 will be used for this LAN computer, as ports 1024-1050 are already in use by the preceding rule. The status is set to "Active".

Every new NAT/NAPT rule is verified in relation to preceding rules. Rules are prioritized according to the order in which they are defined. As long as at least one unused IP address (or port) is available, the rule will be accepted. However, as seen in the examples above, not all addresses in the range defined may be available for computers in that rule; some may already be in use by other rules. OpenRG automatically calculates the relationships between rules, narrowing down the address ranges if needed, and thus provides great flexibility for user input.

The verification performed by OpenRG is as follows:

- NAT rule – Verifies whether the IP address is already in use by another NAT/NAPT rule.
- NAPT rule

  1. Verifies whether the port is already in use by another NAPT rule activated on the same IP address.
  2. Verifies whether the IP address is already in use by another NAT rule.

4.3 Managing Your Bandwidth with Quality of Service

Network-based applications and traffic are growing at a high rate, producing an ever-increasing demand for bandwidth and network capacity. For obvious reasons, bandwidth and capacity cannot be expanded infinitely, requiring that bandwidth-demanding services be delivered over existing infrastructure, without incurring additional, expansive investments.

The next logical means of ensuring optimal use of existing resources are Quality of Service (QoS) mechanisms for congestion management and avoidance. Quality of Service refers to

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the capability of a network device to provide better service to selected network traffic. This is achieved by shaping the traffic and processing higher priority traffic before lower priority traffic.

As Quality of Service is dependent on the "weakest link in the chain", failure of but a single component along the data path to assure priority packet transmission can easily cause a VoIP call or a Video on Demand (VoD) broadcast to fail miserably. QoS must therefore obviously be addressed end-to-end.

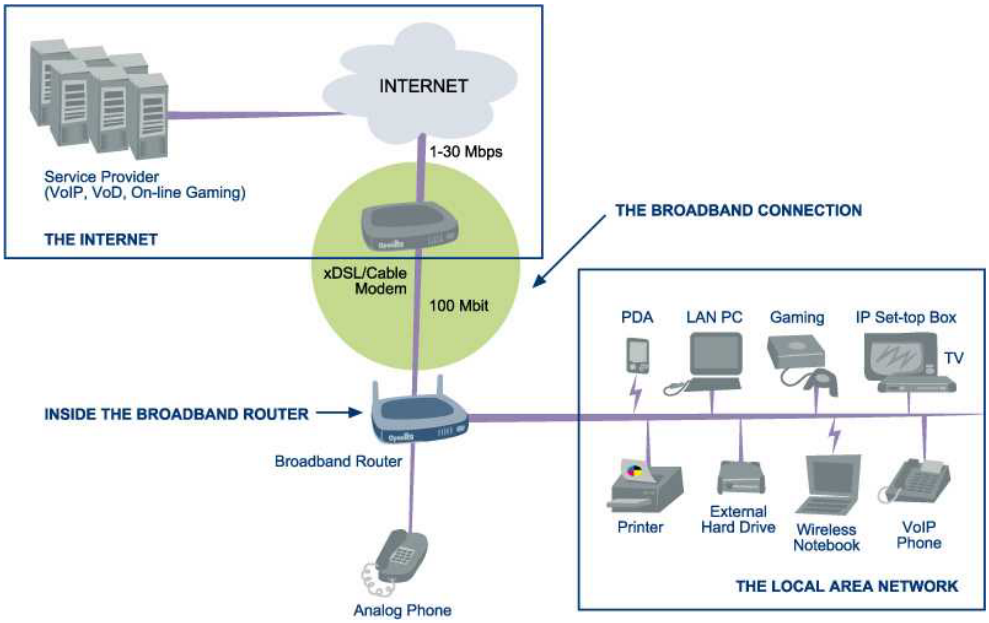

Figure 4.42 End-to-end QoS Challenge Areas

The following are the potential bottleneck areas that need be taken into consideration when implementing an end-to-end QoS-enabled service.

- **The Local Area Network** LANs have finite bandwidth, and are typically limited to 100 Mbps. When given the chance, some applications will consume all available network bandwidth. In business networks, a large number of network-attached devices can lead to congestion. The need for QoS mechanisms is more apparent in wireless LANs (802.11a/b/g), where bandwidth is even more limited (typically no more than 20 Mbps on 802.11g networks).

- **The Broadband Router** All network traffic passes through and is processed by the broadband router. It is therefore a natural focal point for QoS implementation. Lack of sufficient buffer space, memory or processing power, and poor integration among system components can result in highly undesirable real-time service performance. The only way to assure high quality of service is the use of proper and tightly-integrated router operating system software and applications, which can most effectively handle multiple real-time services simultaneously.

- **The Broadband Connection** Typically the most significant bottleneck of the network, this is where the high speed LAN meets limited broadband bandwidth. Special QoS mechanisms must be built into routers to ensure that this sudden drop in connectivity speed is taken into account when prioritizing and transmitting real-time service-related data packets.

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- **The Internet** Internet routers typically have a limited amount of memory and bandwidth available to them, so that congestions may easily occur when links are over-utilized, and routers attempt to queue packets and schedule them for retransmission. One must also consider the fact that while Internet backbone routers take some prioritization into account when making routing decisions, all data packets are treated equally under congested conditions.

The following figure depicts OpenRG's QoS role and architecture in a network. Many of the terms it contains will become familiar as you read on.

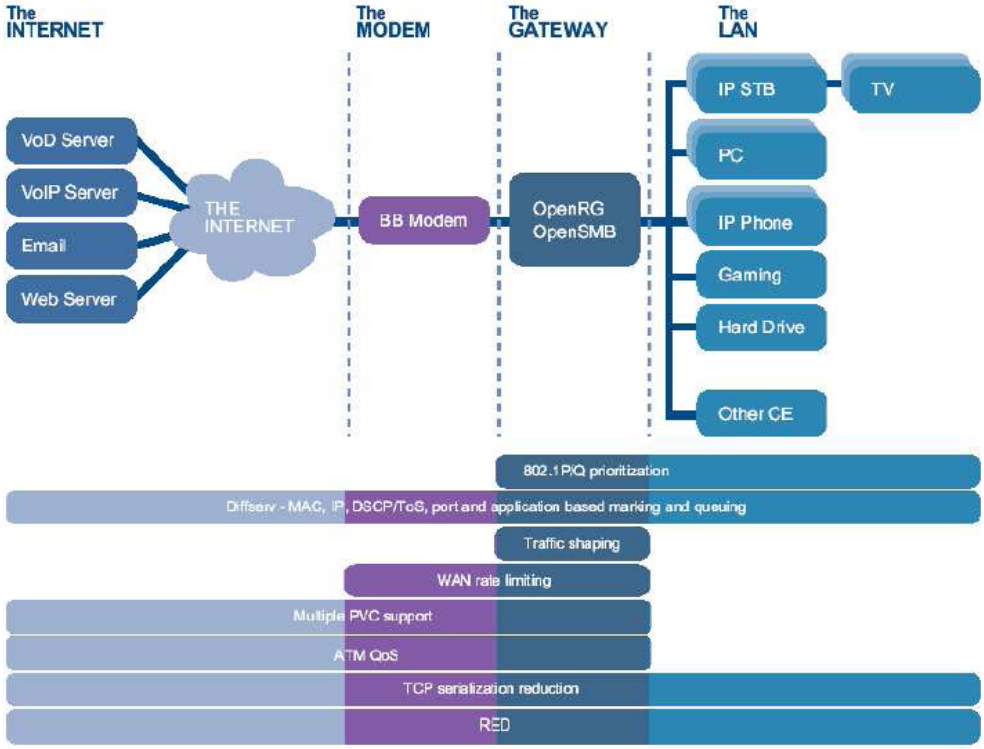

Figure 4.43 OpenRG's QoS Architecture

4.3.1 Selecting a QoS Profile

The 'General' screen provides a Quality of Service "wizard", with which you can configure your QoS parameters according to predefined profiles, with just a few clicks. A chosen QoS profile will automatically define QoS rules, which you can view and edit in the rest of the QoS tab screens, described later.

Note: Selecting a QoS profile will cause all previous QoS configuration settings to be **permanently lost**.

Click the QoS tab under 'Services'. The 'General' screen appears with the 'Overview' link being selected.

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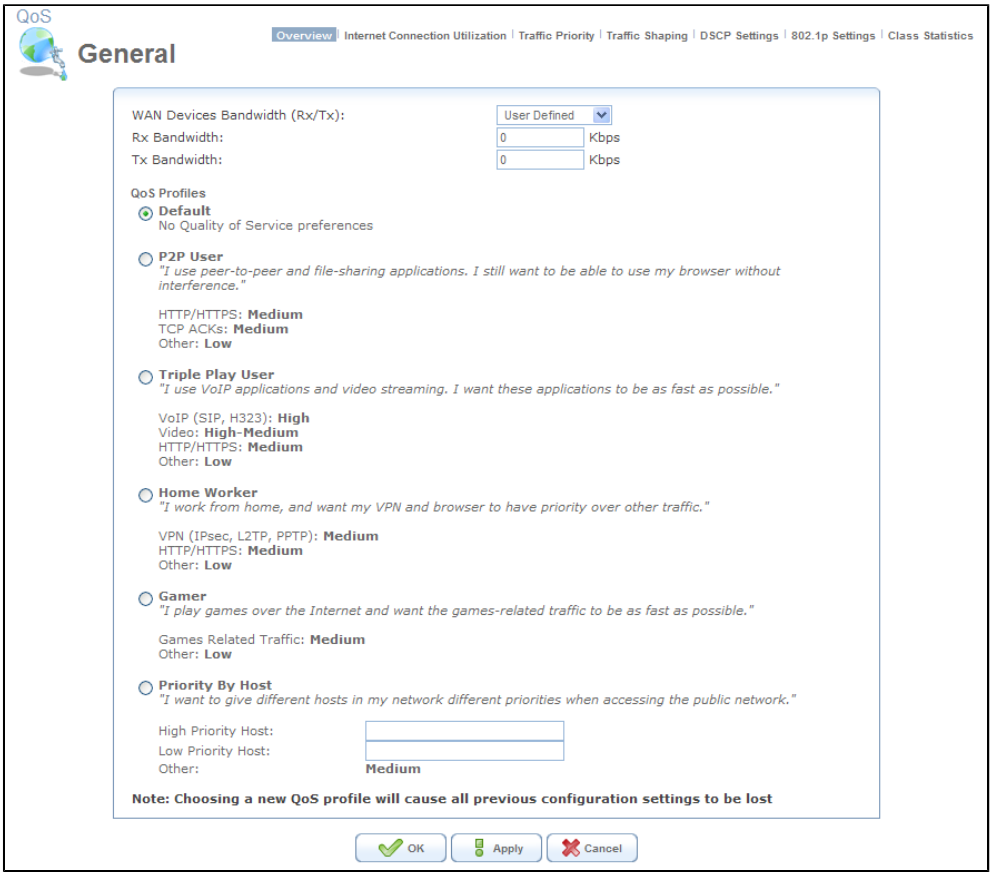

Figure 4.44 General

WAN Devices Bandwidth (Rx/Tx) Before selecting the QoS profile that mostly suits your needs, select your bandwidth from this drop-down menu. If you do not see an appropriate entry, select 'User Defined', and enter your Tx and Rx bandwidths manually.

- **Tx Bandwidth** This parameter defines the gateway's outbound transmission rate. Enter your Tx bandwidth in Kbits per second.
- **Rx Bandwidth** This parameter defines the gateway's Internet traffic reception rate. Enter your Rx bandwidth in Kbits per second.

Note: By default, these parameters are set to 0 Kbps, which means that the bandwidth has not been limited on OpenRG. Entering inaccurate Tx/Rx values will cause incorrect behavior of the QoS module. It is important to set these values as accurately as possible.

If you wish to restore the default bandwidth settings, select 'Unlimited' from the drop-down menu, and click 'Apply'. Note that you can also set the desired bandwidth on the WAN (or any other) device in the 'Traffic Shaping' screen (to learn how to do so, refer to Section 4.3.4.1).

QoS Profiles Select the profile that mostly suits your bandwidth usage. Each profile entry displays a quote describing what the profile is best used for, and the QoS priority levels granted to each bandwidth consumer in this profile.

- Default – No QoS profile, however the device is limited by the requested bandwidth, if specified.

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- P2P User – Peer-to-peer and file sharing applications will receive priority.
- Triple Play User – VoIP and video streaming will receive priority.
- Home Worker – VPN and browsing will receive priority.
- Gamer – Game-related traffic will receive priority.
- Priority By Host – This entry provides the option to configure which computer in your LAN will receive the highest priority and which the lowest. If you have additional computers, they will receive medium priority.

  High Priority Host Enter the host name or IP address of the computer to which you would like to grant the highest bandwidth priority.

  Low Priority Host Enter the host name or IP address of the computer to which you would like to grant the lowest bandwidth priority.

4.3.2 Viewing Your Bandwidth Utilization

The 'Internet Connection Utilization' screen provides detailed real-time information regarding the usage of your Internet connection's bandwidth. At any time, you can view an up-to-date bandwidth usage report on both the application and computer level.

4.3.2.1 Application View

The 'Utilization by Application' table displays the following information fields. You can sort the table according to these fields (ascending or descending), by clicking the fields' names. Note that you can stop the screen's refreshing by using the 'Automatic Refresh Off' button at the bottom of the screen.

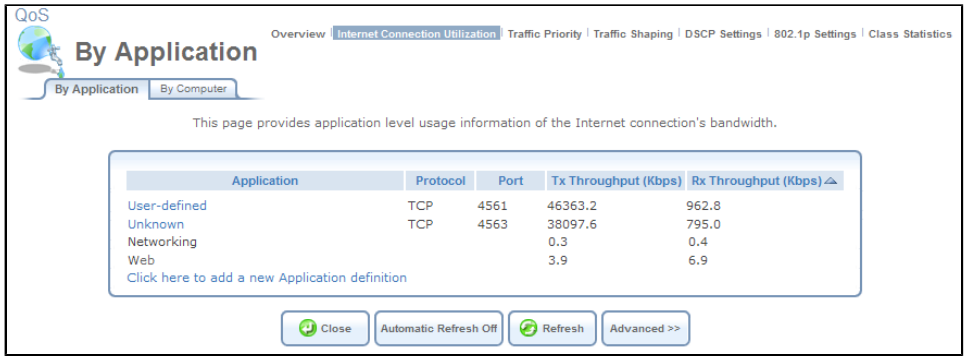

Figure 4.45 Utilization by Application

Application A list of categories of applications that are currently using the bandwidth. This section may also display user-defined or unknown applications that had not been identified by OpenRG as belonging to one of the pre-defined categories. In this case, their names will appear as links, which you can click to view their details.

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Protocol The application's network protocol.

Port The port through which traffic is transferred.

Tx Throughput The transmission bit rate in kilo-bits per second.

Rx Throughput The reception bit rate in kilo-bits per second.

To view the applications that underlie the displayed categories, click the 'Advanced' button.

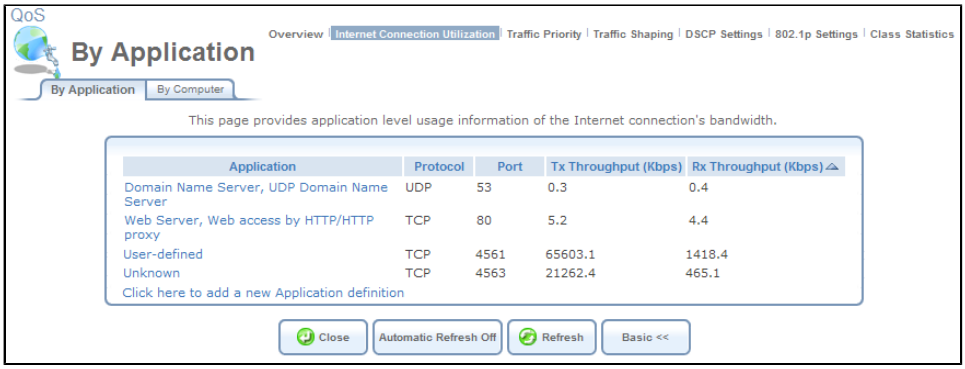

Figure 4.46 Utilization by Application – Advanced View

In this view, you can click each application's name to view its details, particularly which LAN computer is running it.

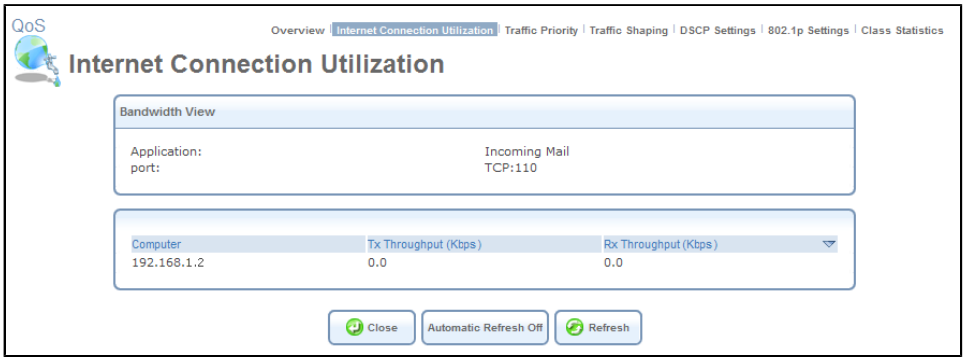

Figure 4.47 A Specific Application

4.3.2.2 Computer View

The 'Utilization by Computer' table displays the sum of bandwidth used by each LAN computer. The fields displayed are the computer's IP address and the Tx and Rx throughput.

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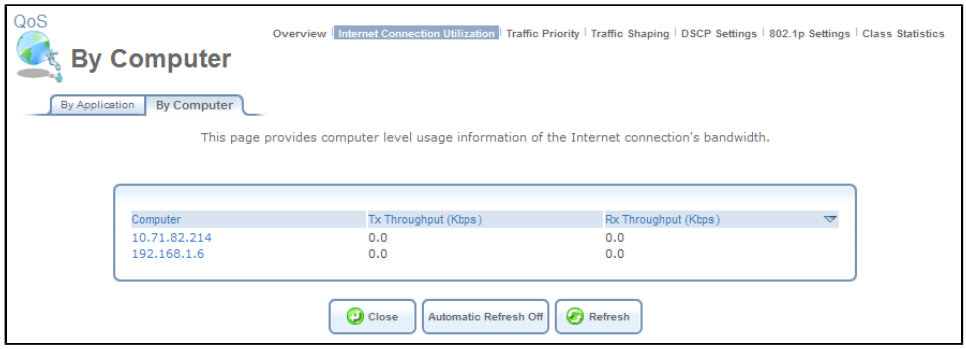

Figure 4.48 Utilization by Computer

Click a computer's IP address to view the bandwidth-consuming applications running on that computer.

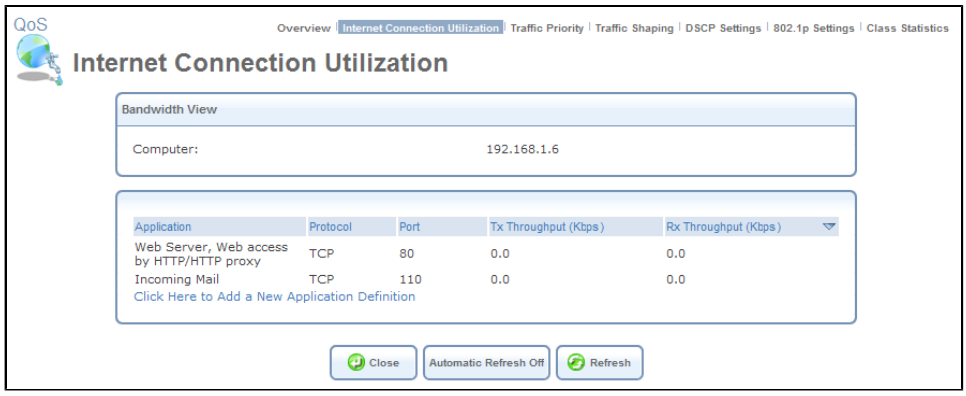

Figure 4.49 A Specific Computer

In this example, computer 192.168.1.6 is running the applications "Web Server" and "Incoming Mail". This screen provides a combined computer and application view, by displaying a computer-specific application table.

4.3.3 Defining Traffic Priority Rules

Traffic Priority allows you to manage and avoid traffic congestion by defining inbound and outbound priority rules for each device on your gateway. These rules determine the priority that packets, traveling through the device, will receive. QoS parameters (DSCP marking and packet priority) are set per packet, on an application basis. You can set QoS parameters using flexible rules, according to the following parameters:

- Source/destination IP address, MAC address or host name
- Device
- Source/destination ports
- Limit the rule for specific days and hours

OpenRG supports two priority marking methods for packet prioritization:

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- DSCP (refer to Section 4.3.5).
- 802.1p Priority (refer to Section 4.3.6).

The matching of packets by rules is connection-based, known as Stateful Packet Inspection (SPI), using the same connection-tracking mechanism used by OpenRG's firewall. Once a packet matches a rule, all subsequent packets with the same attributes receive the same QoS parameters, both inbound and outbound. A packet can match more than one rule. Therefore:

- The first class rule has precedence over all other class rules (scanning is stopped once the first rule is reached).
- The first traffic-priority (classless) rule has precedence over all other traffic-priority rules.
- There is no prevention of a traffic-priority rule conflicting with a class rule. In this case, the priority and DSCP setting of the class rule (if given) will take precedence.

Connection-based QoS also allows inheriting QoS parameters by some of the applications that open subsequent connections. For instance, you can define QoS rules on SIP, and the rules will apply to both control and data ports (even if the data ports are unknown). This feature applies to all applications that have ALG in the firewall, such as:

- SIP
- MSN Messenger/Windows Messenger
- TFTP
- FTP
- MGCP
- H.323
- Port Triggering applications (refer to Section 4.2.4)
- PPTP
- IPSec

To set traffic priority rules:

1. Under the 'QoS' menu item, click 'Traffic Priority'. The 'Traffic Priority' screen appears (see Figure 4.50). This screen is divided into two identical sections, one for 'QoS input rules' and the other for 'QoS output rules', which are for prioritizing inbound and outbound traffic, respectively. Each section lists all the gateway devices on which rules can be set. You can set rules on all devices at once, using the 'All devices' entry.

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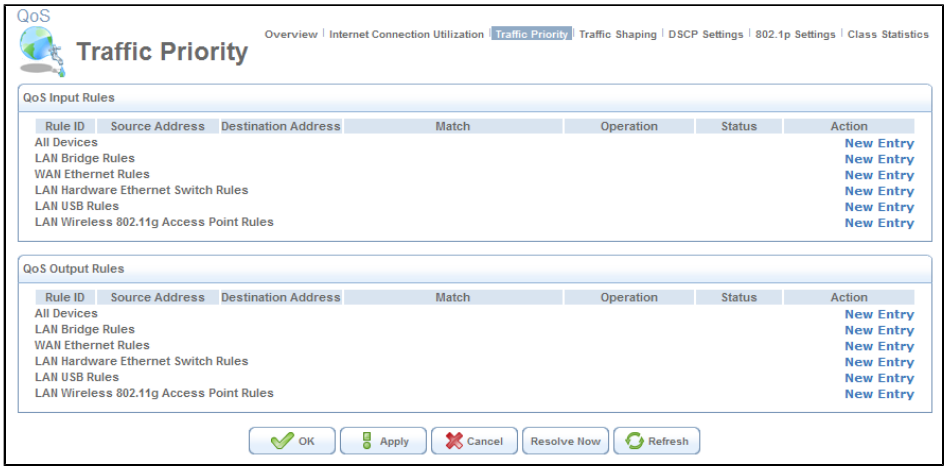
QoS
Traffic Priority
Overview | Internet Connection Utilization | Traffic Priority | Traffic Shaping | DSCP Settings | 802.1p Settings | Class Statistics
QoS Input Rules
Rule ID | Source Address | Destination Address | Match | Operation | Status | Action
All Devices
LAN Bridge Rules
WAN Ethernet Rules
LAN Hardware Ethernet Switch Rules
LAN USB Rules
LAN Wireless 802.11g Access Point Rules
New Entry
QoS Output Rules
Rule ID | Source Address | Destination Address | Match | Operation | Status | Action
All Devices
LAN Bridge Rules
WAN Ethernet Rules
LAN Hardware Ethernet Switch Rules
LAN USB Rules
LAN Wireless 802.11g Access Point Rules
New Entry
OK
Apply
Cancel
Resolve Now
Refresh

Figure 4.50 Traffic Priority

2. After choosing the traffic direction and the device on which to set the rule, click the appropriate 'New Entry' link. The 'Add Traffic Priority Rule' screen appears.

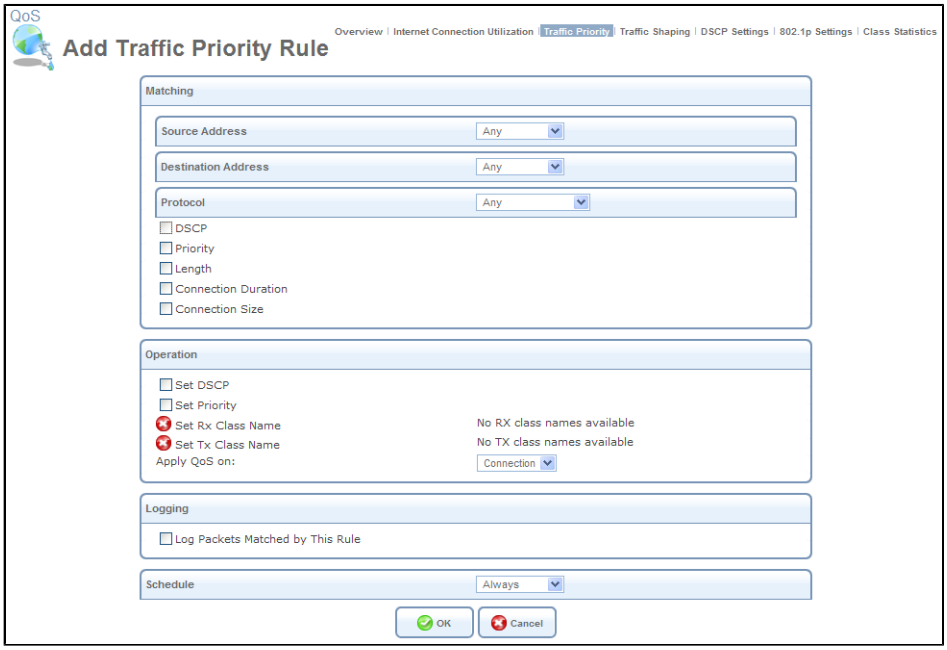

Figure 4.51 Add Traffic Priority Rule

This screen is divided into two main sections, 'Matching' and 'Operation', which are for defining the operation to be executed when matching conditions apply.

Matching Use this section to define characteristics of the packets matching the rule.

- **Source Address** The source address of packets sent or received by OpenRG. Use this drop-down menu to specify the computer or group of computers on which you would like to apply the rule. Select an address or a name from the list to apply the rule on the corresponding host, or 'Any' to apply the rule on any host trying to send data. If you would like to add a new address, select the 'User Defined' option in the drop-down menu. This will commence a sequence that will add a new **Network Object**, representing the new host.

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- **Destination Address** The destination address of packets sent or received by OpenRG. This address can be configured in the same manner as the source address. For example, use this drop-down menu to specify an IP address of a remote application server (such as a security server), which requires that the incoming packets have a specific IP address (e.g., one of those defined in your NAT IP address pool).

- **Protocol** You may also specify a traffic protocol. Selecting the 'Show All Services' option from the drop-down menu expands the list of available protocols. Select a protocol or add a new one using the 'User Defined' option. This will commence a sequence that will add a new **Service**, representing the protocol.

  Using a protocol requires observing the relationship between a client and a server, in order to distinguish between the source and destination ports. For example, let's assume you have an FTP server in your LAN, serving clients inquiring from the WAN. You want to apply a QoS rule on incoming packets from any port on the WAN (clients) trying to access FTP port 21 (your server), and the same for outgoing packets from port 21 trying to access any port on the WAN. Therefore, you must set the following Traffic Priority rules:

  - In the 'Matching' section of 'QoS Input Rules', select 'FTP' from the 'Protocol' drop-down menu. The 'TCP Any -> 21' setting appears under 'Ports'.

  - Define a priority in the 'Operation' section.

  - Click 'OK' to save the settings.

  - Define a QoS output rule in the same way as the input rule.

- **DSCP** Select this check box to display two DSCP fields, which enable you to specify a hexadecimal DSCP value and its mask assigned to the packets matching the priority rule. For more information, refer to Section 4.3.5.

- **Priority** Select this check box to display a drop-down menu, in which you can select a priority level assigned to the packets matching the priority rule.

- **Device** Select this check box to display a drop-down menu, in which you can select a network device on which the packet-rule matching will be performed. This option is relevant in case you have previously selected the 'All Devices' option in the 'Traffic Priority' screen (see Figure 4.50).

- **Length** Select this check box if you would like to specify the length of packets, or the length of their data portion.

Note: The following two options are applicable only if the Fastpath feature is disabled in the 'Routing' menu item under 'System'. Depending on your gateway's model, the feature's name may appear as 'Software Acceleration' or 'Hardware Acceleration'.

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- **Connection Duration** Select this check box to apply the priority rule only on connections which are open for a certain time period. This option is especially useful if you would like to accelerate your Web browsing by lowering the speed of concurrently running download jobs, or vice versa. After selecting the check box, choose whether the duration of connections matching the rule should be greater or less than the time that you specify in the adjacent field.

Figure 4.52 Connection Duration

For example, if you define the connection duration as less than 10 seconds, you will notice acceleration of your Web browsing and small file downloads, but slowing down of your large file downloads. The reason for this is that when a connection passes the specified time limit (as in case of a large file download), its priority is lowered, thereby giving more priority to shorter connections.

- **Connection Size** Select this check box to apply the priority rule only on connections matching a certain data size limit. This option is best used along with the 'Connection Duration' option, enabling you to fine-tune the gateway's traffic priority mechanism according to your needs. After selecting the check box, choose whether the connection's data size should be greater or less than the number of kilobytes that you specify in the adjacent field.

Figure 4.53 Connection Size

For example, if you define the connection size as less than 400 kilobytes, you will notice acceleration of Web browsing, and lowering of your file download speed. The reason for this is that when a connection exceeds the specified data size limit, its priority is lowered, thereby giving more priority to connections with a smaller data size.

Operation Perform the following operation/s on packets that match the priority rule.

- **Set DSCP** Select this check box if you would like to change the DSCP value on packets matching the rule, prior to routing them further. The screen refreshes (see Figure 4.54), enabling you to enter the hexadecimal DSCP value in its respective field that appears.

Figure 4.54 Set DSCP Rule

- **Set Priority** Select this check box if you would like to change a priority of the packets matching the rule. The screen refreshes (see Figure 4.55), enabling you to select between one of eight priority levels, zero being the lowest and seven the highest. Each priority level is assigned a default queue number, where Queue 0 has the lowest priority. OpenRG's QoS supports up to eight queues.

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Figure 4.55 Set Priority with Queueing

The matching between a priority level and a queue number can be edited in the '802.1p Settings' screen (for more information, refer to Section 4.3.6).

- **Apply QoS on** Select whether to apply QoS on a connection or just the first packet. When applying on a connection, the data transfer session will be handled using Stateful Packet Inspection (SPI). This means that other packets matching this rule will be automatically allowed to access, and the same QoS scheme will be applied to them.

Logging Monitor the rule.

- **Log Packets Matched by This Rule** Select this check box to log the first packet from a connection that was matched by this rule.

Schedule By default, the rule will always be active. However, you can define time segments during which the rule may be active, by selecting 'User Defined' from the 'Schedule' drop-down menu. If more than one scheduler rule is defined, the 'Schedule' drop-down menu will allow you to choose between the available rules. To learn how to configure scheduler rules, refer to the 'Defining Scheduler Rules' section of the OpenRG Administrator Manual.

3. Click 'OK' to save the settings.

The order of the rules' appearance represents both the order in which they were defined and the sequence by which they will be applied. You may change this order after your rules are already defined (without having to delete and then re-add them), by using the action icon and action icon .

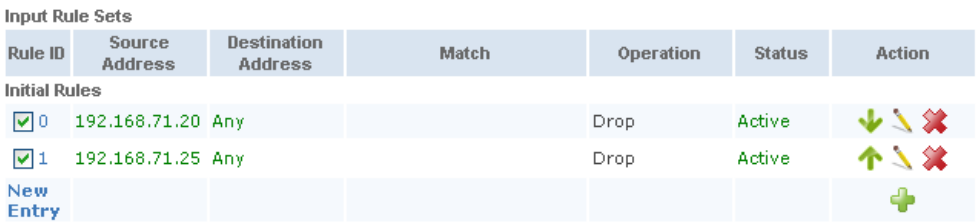

Figure 4.56 Move Up and Move Down Action Icons

4.3.4 Avoiding Congestion with Traffic Shaping

Traffic Shaping is the solution for managing and avoiding congestion where a high speed LAN meets limited broadband bandwidth. In the scenario of a 100 Mbps Ethernet LAN with a 100 Mbps WAN interface gateway, the gateway may have to communicate with the ISP using a modem with a bandwidth of 2Mbps. This typical configuration makes the modem, having no QoS module, the bottleneck.

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Instead of sending traffic as fast as it is received, OpenRG's QoS algorithms perform traffic shaping, limiting the bandwidth of the gateway, thus artificially forcing it to become the bottleneck. A traffic shaper is essentially a regulated queue that accepts uneven and/or bursty flows of packets and transmits them in a steady, predictable stream so that the network is not overwhelmed with traffic. While Traffic Priority allows basic prioritization of packets, Traffic Shaping provides more sophisticated definitions, such as:

- Bandwidth limit for each device
- Bandwidth limit for classes of rules
- Prioritization policy
- TCP serialization on a device

Additionally, you can define QoS traffic shaping rules for a default device. These rules will be used on a device that has no definitions of its own. This enables the definition of QoS rules on Default WAN, for example, and their maintenance even if the PPP or bridge device over the WAN is removed.

4.3.4.1 Shaping the Traffic of a Device

To shape the traffic of a device, perform the following:

1. Click 'Traffic Shaping' under the QoS tab in the 'Services' screen. The 'Traffic Shaping' screen appears.

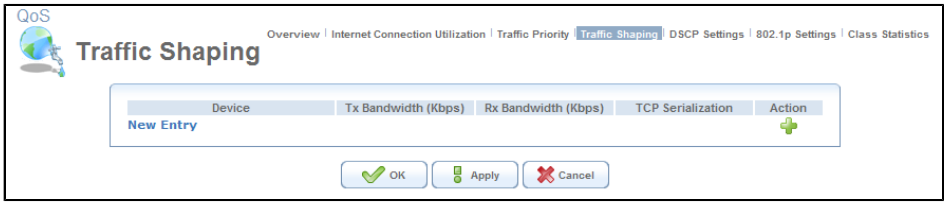

Figure 4.57 Traffic Shaping

2. Click the 'New Entry' link. The 'Add Device Traffic Shaping' screen appears (see Figure 4.58).

3. Select the device for which you would like to shape the traffic. The drop-down menu includes all your gateway's devices, and you can select either a specific device for which to shape the traffic, or 'Any Device' to add a traffic class to all devices. In this example, select the WAN Ethernet option.

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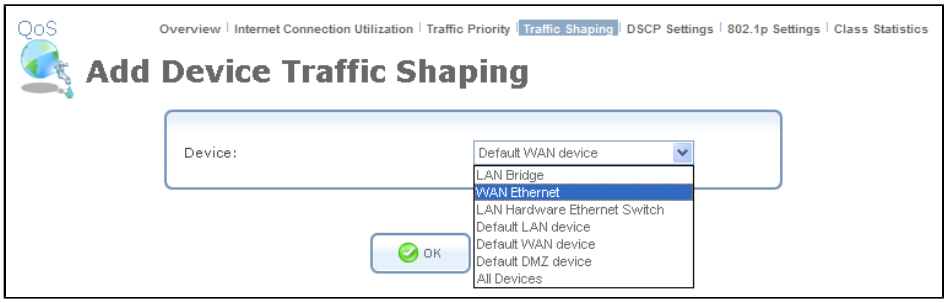

Figure 4.58 Add Device Traffic Shaping

If you would like to configure OpenRG's LAN traffic transmission/reception rate, select the relevant LAN device. If you would like to apply the settings on all LAN devices, select the 'Default LAN Device' entry.

4. Click 'OK'. The 'Edit Device Traffic Shaping' screen appears.

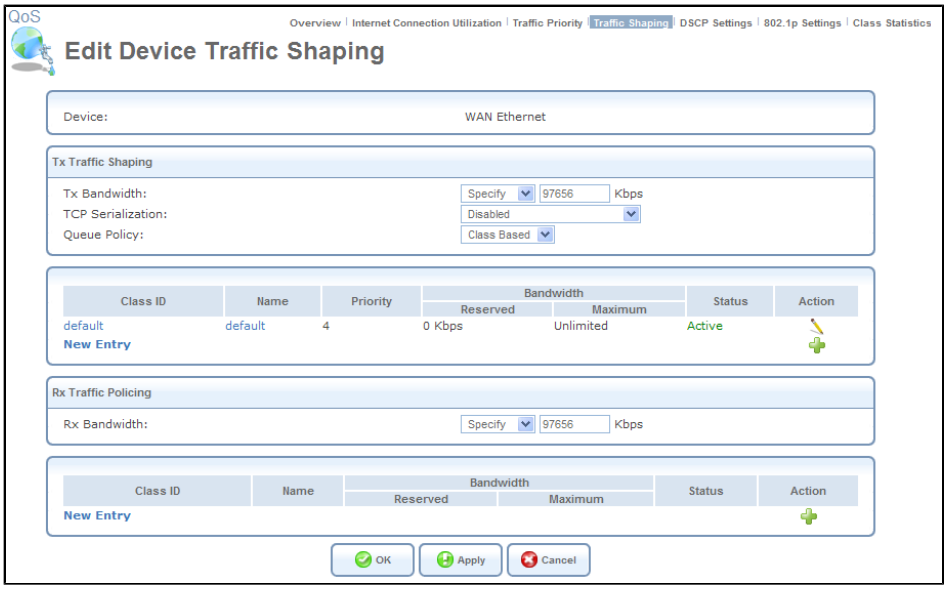

Figure 4.59 Edit Device Traffic Shaping

5. Configure the following fields:

Tx Bandwidth This parameter limits the gateway's bandwidth transmission rate. The purpose is to limit the bandwidth of the WAN device to that of the weakest outbound link, for instance, the DSL speed provided by the ISP. This forces OpenRG to be the network bottleneck, where sophisticated QoS prioritization can be performed. If the device's bandwidth is not limited correctly, the bottleneck will be in an unknown router or modem on the network path, rendering OpenRG's QoS useless.

TCP Serialization You can enable TCP Serialization in its drop-down menu, either for active voice calls only or for all traffic. The screen will refresh, adding a 'Maximum Delay' field (see Figure 4.60). This function allows you to define the maximal allowed transmission time frame (in milliseconds) of a single packet. Any packet that requires a longer time to be transmitted, will be fragmented to smaller sections. This avoids

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transmission of large, bursty packets that may cause delay or jitter for real-time traffic such as VoIP. If you insert a delay value in milliseconds, the delay in number of bytes will be automatically updated on refresh.

Figure 4.60 TCP Serialization – Maximum Delay

Queue Policy Tx traffic queueing can be based on a traffic class (see the following explanations) or on the pre-defined priority levels (refer to Section 4.3.3). Note that when it is based on a traffic class, the class's bandwidth requirements will be met regardless of the priority, and only excess bandwidth will be given to traffic with a higher priority. However, when unlimited bandwidth is selected for the Tx traffic, the queue policy can only be based on the pre-defined priority levels.

4.3.4.2 Creating a Traffic Shaping Class

The bandwidth of a device can be divided in order to reserve constant portions of bandwidth to predefined traffic types. Such a portion is known as a *Traffic Shaping Class*. When not used by its predefined traffic type, or owner (for example VoIP), the bandwidth will be available to all other traffic. However when needed, the entire class is reserved solely for its owner.

Moreover, you can limit the maximum bandwidth that a class can use even if the entire bandwidth is available. When a traffic class is first defined for a specific traffic type, two classes are created. The second class is the 'Default Class', which is responsible for all the packets that *do not* match the defined traffic class, or any other classes that may be defined on the device. You can also define **wildcard** devices, such as all WAN devices. This can be viewed in the 'Class Statistics' screen (see Figure 4.70).

To define a new traffic shaping class, perform the following:

1. In the 'Edit Device Traffic Shaping' screen (see Figure 4.59), click the 'New Entry' link in the 'Tx Traffic Shaping' section. The 'Add Shaping Class' screen appears.

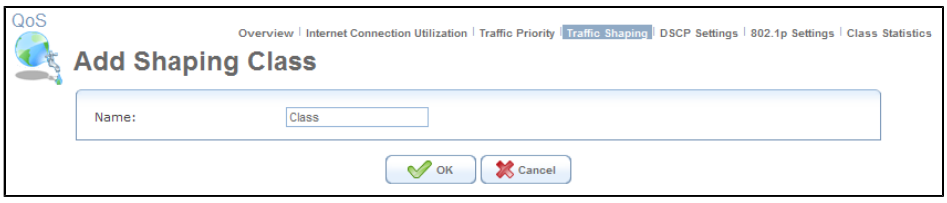
QoS
Overview | Internet Connection Utilization | Traffic Priority | Traffic Shaping | DSCP Settings | 802.1p Settings | Class Statistics
Add Shaping Class
Name:
Class
OK
Cancel

Figure 4.61 Add Shaping Class

2. Name the new class and click 'OK' to save the settings, e.g. Class A.

3. Back in the 'Edit Device Traffic Shaping' screen, click the class name to edit the traffic class. Alternatively, click its action icon . The 'Edit Shaping Class' screen appears.

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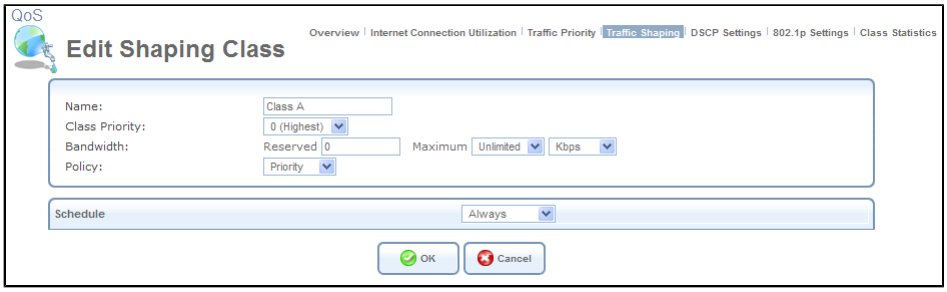

Figure 4.62 Edit Shaping Class

4. Configure the following fields:

Name The name of the class.

Class Priority The class can be granted one of eight priority levels, zero being the highest and seven the lowest (note the obversion when compared to the rules priority levels). This level sets the priority of a class in comparison to other classes on the device.

Bandwidth The reserved transmission bandwidth in kilo-bits per second. You can limit the maximum allowed bandwidth by selecting the 'Specify' option in the drop-down menu. The screen will refresh, adding another Kbits/s field.

Figure 4.63 Specify Maximum Bandwidth

Policy The class policy determines the policy of routing packets inside the class. Select one of the four options:

- **Priority** Priority queuing utilizes multiple queues, so that traffic is distributed among queues based on priority. This priority is defined according to packet's priority, which can be defined explicitly, by a DSCP value (refer to Section 4.3.5), or by a 802.1p value (refer to Section 4.3.6).
- **FIFO** The "First In, First Out" priority queue. This queue ignores any previously-marked priority that packets may have.
- **Fairness** The fairness algorithm ensures no starvation by granting all packets a certain level of priority.
- **RED** The Random Early Detection algorithm utilizes statistical methods to drop packets in a "probabilistic" way before queues overflow. Dropping packets in this way slows a source down enough to keep the queue steady and reduces the number of packets that would be lost when a queue overflows and a host is transmitting at a high rate.
- **WRR** Weighted Round Robin utilizes a process scheduling function that prioritizes traffic according to the pre-defined 'Weight' parameter of a traffic's class. This level of prioritizing provides more flexibility in distributing bandwidth between traffic types, by defining additional classes within a parent class.

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Schedule By default, the class will always be active. However, you can configure scheduler rules in order to define time segments during which the class may be active. To learn how to configure scheduler rules, refer to the 'Defining Scheduler Rules' section of the OpenRG Administrator Manual.

4.3.4.3 Setting an Incoming Traffic Policy

When shaping the traffic for a device, you must also determine a policy for incoming traffic. In the 'Edit Device Traffic Shaping' screen (see Figure 4.59), configure the following fields in the 'Rx Traffic Policing' section:

Rx Bandwidth This parameter limits the device's bandwidth reception rate. In this example, the purpose is to limit the bandwidth that the WAN device can receive from the ISP.

Queue Policy Similar to Tx traffic, Rx traffic queueing can be based on a traffic class or on strict priority (unless unlimited bandwidth is selected). By default, however, the queue policy is set to Policer, which is a relatively simple method of bandwidth control. With the policer option, you can dedicate a portion of the bandwidth to a certain traffic type. This portion will always remain available to its traffic type, even when not in use. This is a simpler method, as prioriy is not used at all.

When selecting a class-based queue policy, you must define an Rx Traffic Policy Class, which is identical to defining a Tx Traffic Shaping Class, described earlier. However if you select the policer as your queue policy, defining a policing class is even simpler, as it lacks the priority setup.

To define an Rx traffic policy class, perform the following:

1. In the 'Edit Device Traffic Shaping' screen (see Figure 4.59), click the 'New Entry' link in the 'Rx Traffic Policing' section. The 'Add Policing Class' screen appears.

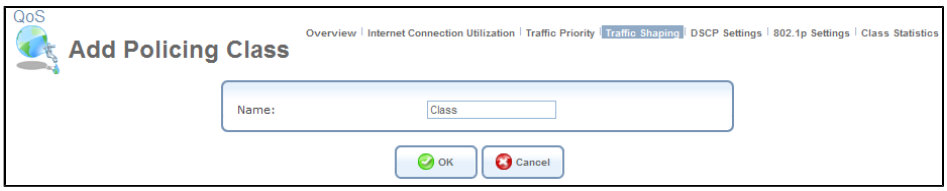
QoS
Add Policing Class
Overview | Internet Connection Utilization | Traffic Priority | Traffic Shaping | DSCP Settings | 802.1p Settings | Class Statistics
Name:
Class
OK
Cancel

Figure 4.64 Add Policing Class

2. Name the new class and click 'OK' to save the settings, e.g. Class B.

3. Back in the 'Edit Device Traffic Shaping' screen, click the class name to edit the traffic class. Alternatively, click its action icon . The 'Edit Policing Class' screen appears.

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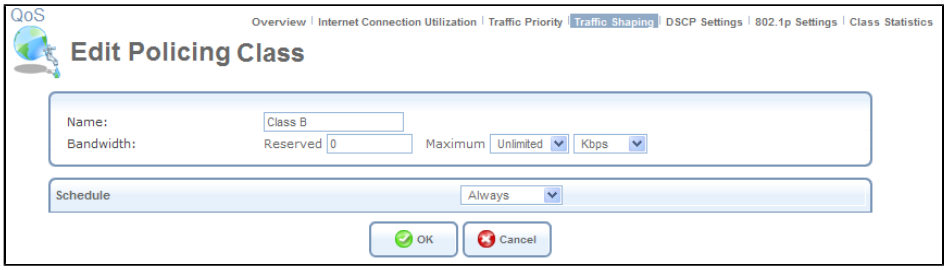

Figure 4.65 Edit Policing Class

Configure the following fields:

Name The name of the class.

Bandwidth The reserved reception bandwidth in kilo-bits per second. You can limit the maximum allowed bandwidth by selecting the 'Specify' option in the combo box. The screen refreshes, adding yet another Kbps field.

Figure 4.66 Specify Maximum Bandwidth

Schedule By default, the class will always be active. However, you can configure scheduler rules in order to define time segments during which the class may be active. To learn how to configure scheduler rules, refer to the 'Defining Scheduler Rules' section of the OpenRG Administrator Manual.

4.3.5 Prioritizing Traffic with DSCP

In order to understand what is Differentiated Services Code Point (DSCP), one must first be familiarized with the *Differentiated Services* model. Differentiated Services (Diffserv) is a Class of Service (CoS) model that enhances best-effort Internet services by differentiating traffic by users, service requirements and other criteria. Packets are specifically marked, allowing network nodes to provide different levels of service, as appropriate for voice calls, video playback or other delay-sensitive applications, via priority queuing or bandwidth allocation, or by choosing dedicated routes for specific traffic flows.

Diffserv defines a field in IP packet headers referred to as DSCP. Hosts or routers passing traffic to a Diffserv-enabled network will typically mark each transmitted packet with an appropriate DSCP. The DSCP markings are used by Diffserv network routers to appropriately classify packets and to apply particular queue handling or scheduling behavior. OpenRG provides a table of predefined DSCP values, which are mapped to 802.1p priority marking method (refer to Section 4.3.6).

You can edit or delete any of the existing DSCP setting, as well as add new entries.

1. Under the QoS menu item, click 'DSCP Settings'. The following screen appears.

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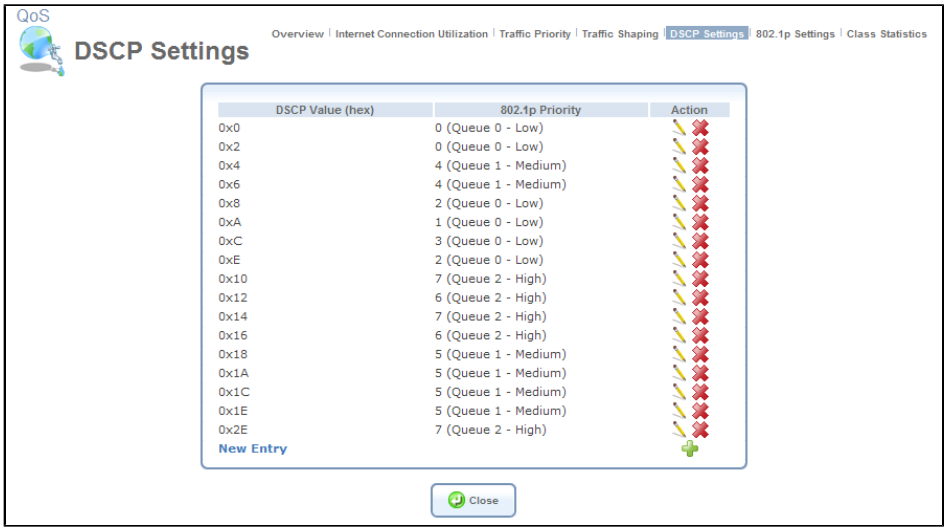
QoS
DSCP Settings
Overview | Internet Connection Utilization | Traffic Priority | Traffic Shaping | DSCP Settings | 802.1p Settings | Class Statistics
DSCP Value (hex) | 802.1p Priority | Action
0x0 | 0 (Queue 0 - Low)
0x2 | 0 (Queue 0 - Low)
0x4 | 4 (Queue 1 - Medium)
0x6 | 4 (Queue 1 - Medium)
0x8 | 2 (Queue 0 - Low)
0xA | 1 (Queue 0 - Low)
0xC | 3 (Queue 0 - Low)
0xE | 2 (Queue 0 - Low)
0x10 | 7 (Queue 2 - High)
0x12 | 6 (Queue 2 - High)
0x14 | 7 (Queue 2 - High)
0x16 | 6 (Queue 2 - High)
0x18 | 5 (Queue 1 - Medium)
0x1A | 5 (Queue 1 - Medium)
0x1C | 5 (Queue 1 - Medium)
0x1E | 5 (Queue 1 - Medium)
0x2E | 7 (Queue 2 - High)
New Entry
Close

Figure 4.67 DSCP--Traffic Priority Matching

Each DSCP value is assigned a default queue number as a part of its 802.1p priority settings. OpenRG's QoS supports up to eight queues, where Queue 0 has the lowest priority.

2. To edit an existing entry, click its action icon . To add a new entry, click the 'New Entry' link. In both cases, the 'Edit DSCP Settings' screen appears.

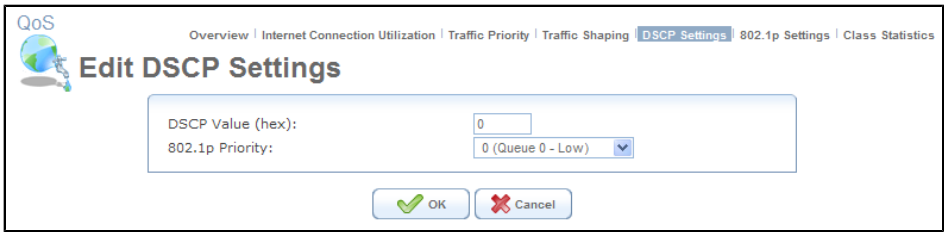
QoS
Overview | Internet Connection Utilization | Traffic Priority | Traffic Shaping | DSCP Settings | 802.1p Settings | Class Statistics
Edit DSCP Settings
DSCP Value (hex): 0
802.1p Priority: 0 (Queue 0 - Low)
OK
Cancel

Figure 4.68 Edit DSCP Settings

3. Configure the following fields:

   DSCP Value (hex) Enter a hexadecimal number that will serve as the DSCP value.

   802.1p Priority Select a 802.1p priority level from the drop-down menu (each priority level is mapped to low/medium/high priority).

4. Click 'OK' to save the settings.

Note: The DSCP value overriding the priority of incoming packets with an unassigned value (priority 0, assumed to be a no-priority-set) is "0x0".

4.3.6 Configuring 802.1p Priority Values

The IEEE 802.1p priority marking method is a standard for prioritizing network traffic at the data link/MAC sub-layer. 802.1p traffic is simply classified and sent to the destination, with

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no bandwidth reservations established. The 802.1p header includes a 3-bit prioritization field, which allows packets to be grouped into eight levels of priority (0-7), where level 7 is the highest one. In addition, OpenRG maps these eight levels to priority queues, where Queue 0 has the lowest priority.

OpenRG's QoS supports up to eight queues. By default, the higher the level and queue values, the more priority they receive. Therefore, the more critical the traffic is, the higher priority level and queue number it should receive. To change the mapping between a priority value and a queue value, perform the following:

1. Under the 'QoS' menu item, click '802.1p Settings'. The following screen appears.

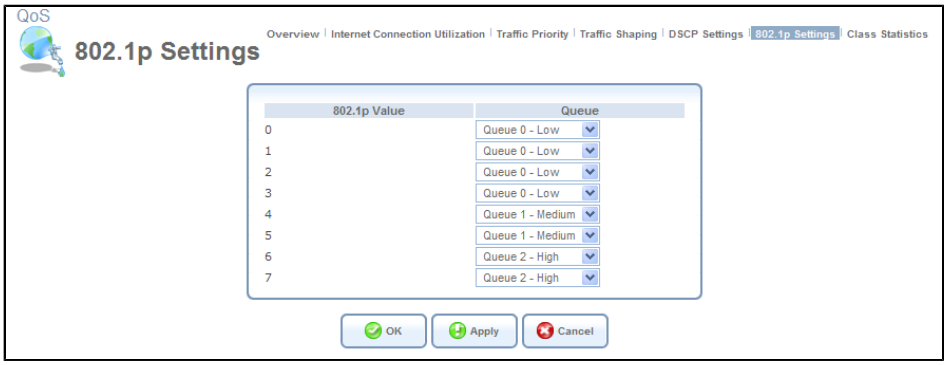
QoS
802.1p Settings
Overview | Internet Connection Utilization | Traffic Priority | Traffic Shaping | DSCP Settings | 802.1p Settings | Class Statistics
802.1p Value
Queue
0 Queue 0 - Low
1 Queue 0 - Low
2 Queue 0 - Low
3 Queue 0 - Low
4 Queue 1 - Medium
5 Queue 1 - Medium
6 Queue 2 - High
7 Queue 2 - High
OK
Apply
Cancel

Figure 4.69 Traffic Queuing in 802.1p Settings

2. From the corresponding drop-down menu, select a desired value.

3. Click 'OK' to save the settings.

4.3.7 Viewing Traffic Statistics

OpenRG provides you with accurate, real-time information on the traffic moving through your defined device classes. For example, the amount of packets sent, dropped or delayed, are just a few of the parameters that you can monitor per each shaping class. To view your class statistics, click 'Class Statistics' under the QoS menu item. The following screen appears.

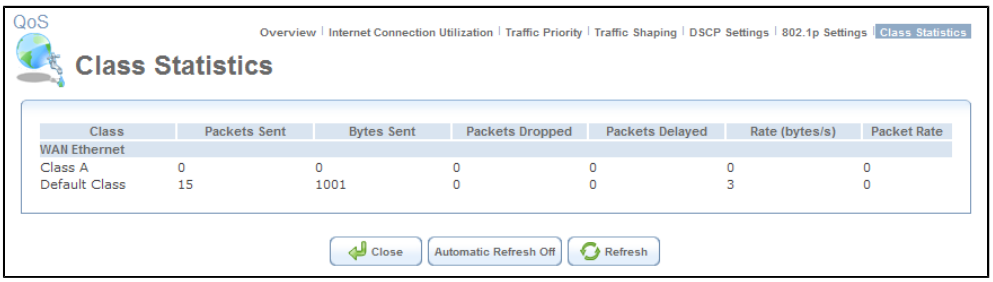

Figure 4.70 Class Statistics

Note that class statistics will only be available after defining at least one class (otherwise the screen will not present any information).

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4.3.8 Example: Providing Priority to a Voice Stream

In order to gain a better understanding of the Quality of Service concept, this section presents a scenario where the WAN bandwidth is shaped to provide priority to a voice stream. When shared by a Voice over IP (VoIP) conversation and a file transfer, the bandwidth will normally be exploited by the file transfer, reducing the quality of the conversation or even casuing it to disconnect. With QoS, the VoIP conversation, which is a real-time session, receives the priority it requires, maintaining a high level of voice quality.

4.3.8.1 Hardware Requirements

- A gateway runnning OpenRG
- Two IP phones
- A LAN computer running an FTP client, containing a large file (100MB)
- A WAN computer running an FTP server

4.3.8.2 Physical Setup

1. Connect an IP phone and the LAN computer to OpenRG's LAN ports.
2. Connect OpenRG's WAN port to your network. The second IP phone and the WAN computer should be available on the WAN.

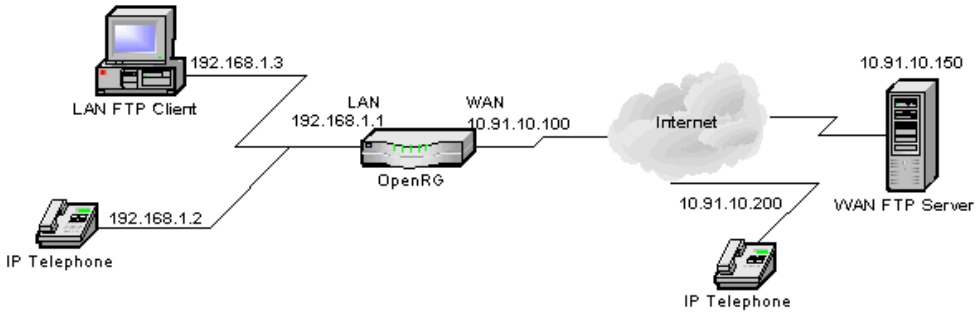

Figure 4.71 Physical Setup

4.3.8.3 Scenario Configuration

1. Configure OpenRG and all other devices with the static IPs described in Figure 4.71.
2. Define a global service for the VoIP stream over a SIP protocol:

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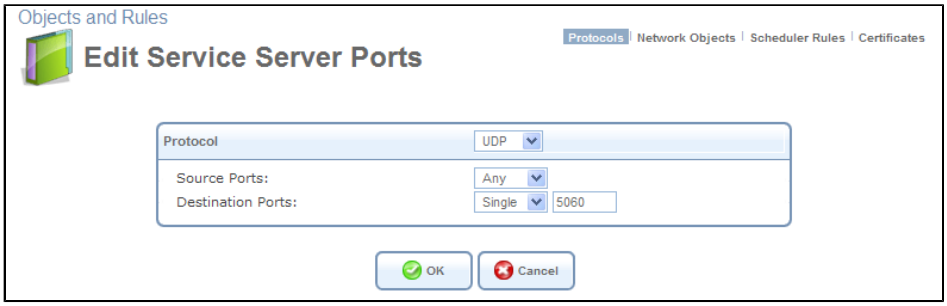

Figure 4.73 Edit Service Server Ports

a. In OpenRG's WBM, click the 'Protocols' icon in the 'Advanced' screen, and then click the 'New Entry' link. The 'Edit Service' screen appears (see Figure 4.72).

b. Enter "SIP" as the service name. You may also add a description for the service.

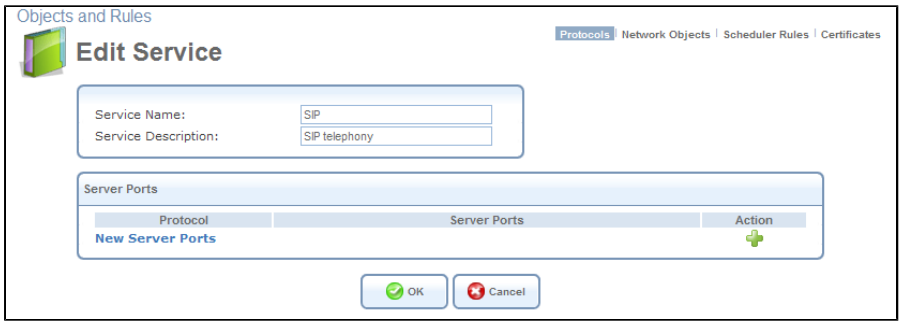

Figure 4.72 Edit Service

c. Click the 'New Server Ports' link. The 'Edit Service Server Ports' screen appears (see Figure 4.73).

d. From the drop-down menu, select the UDP protocol. The screen will refresh.

e. Verify that "Any" is selected from the 'Source Ports' drop-down menu.

f. From the 'Destination Ports' drop-down menu, select "Single". The screen will refresh again.

g. Enter 5060 as the single destination port.

h. Click 'OK' to save the settings.

3. Limit the bandwidth of OpenRG's WAN device:

a. Under the 'QoS' menu item, click 'Traffic Shaping'. The following screen appears.

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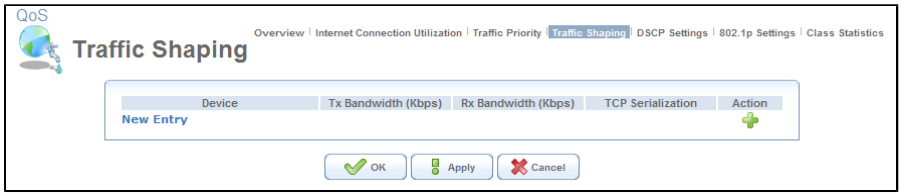

Figure 4.74 Traffic Shaping

b. Click the 'New Entry' link, and select 'All Devices' from the drop-down menu.

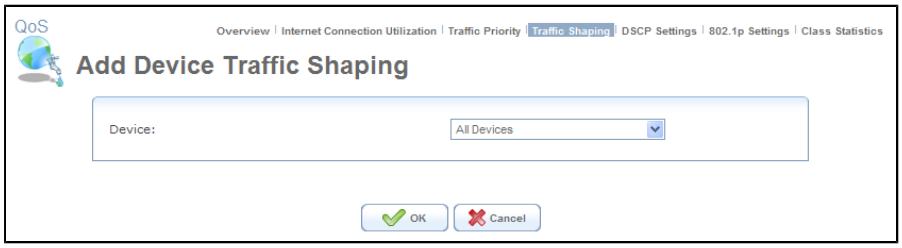
QoS
Add Device Traffic Shaping
Overview | Internet Connection Utilization | Traffic Priority | Traffic Shaping | DSCP Settings | 802.1p Settings | Class Statistics
Device:
All Devices
OK
Cancel

Figure 4.75 Add Device Traffic Shaping

c. Click 'OK'. The 'Edit Device Traffic Shaping' screen appears.

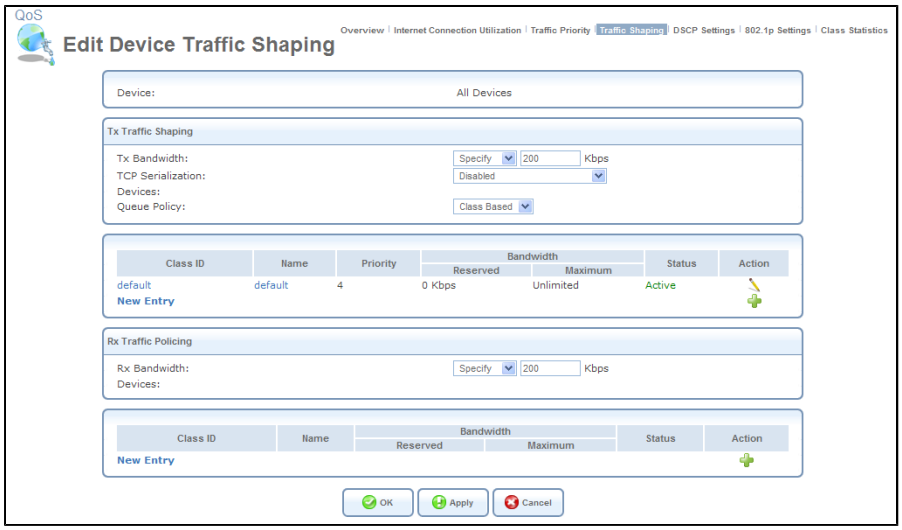

Figure 4.76 Edit Device Traffic Shaping

d. In the Tx Bandwidth drop-down menu, select 'Specify', and enter 200 Kbps in the field that appears.

e. In the Rx Bandwidth drop-down menu, select 'Specify', and enter 200 Kbps in the field that appears.

f. Verify that TCP Serialization is disabled.

4. Configure a QoS class for the Tx and Rx VoIP streams. Perform this procedure twice: once for Tx Traffic Shaping and once for Rx Traffic Policing.

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a. Click the 'New Entry' link in the Tx/Rx traffic shaping section of the 'Edit Device Traffic Shaping' screen. The 'Add Class' screen appears (see Figure 4.77).

b. Name the new class "VoIP Tx/Rx", and click 'OK' to save the settings.

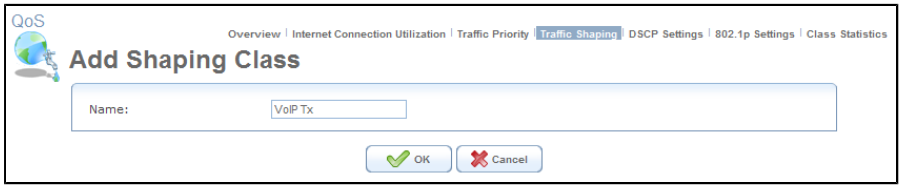
QoS
Overview | Internet Connection Utilization | Traffic Priority | Traffic Shaping | DSCP Settings | 802.1p Settings | Class Statistics
Add Shaping Class
Name:
VoIP Tx
OK
Cancel

Figure 4.77 Add Shaping Class

c. Uncheck the entry in the Class ID column to disable the class at this point (see Figure 4.78).

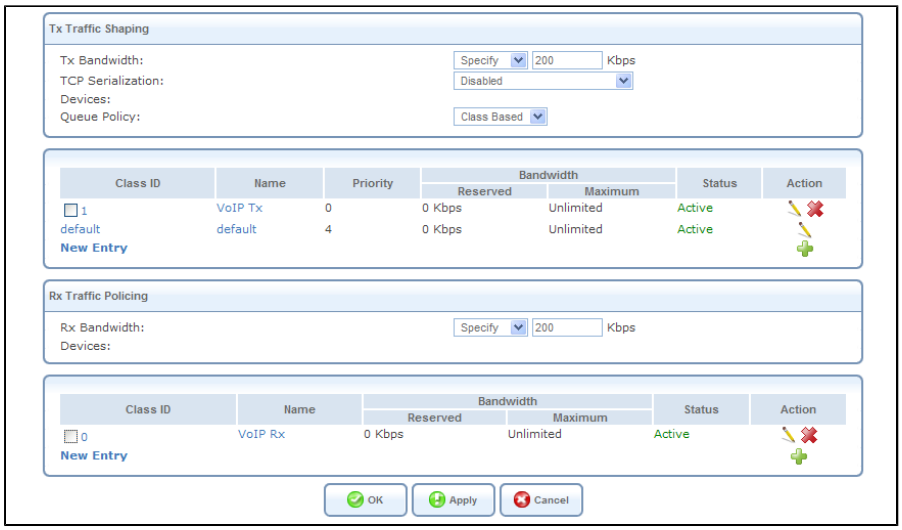

Figure 4.78 Shaping Classes – Uncheck the Class ID

d. Click the class name to edit the shaping class. Alternatively, click its action icon . The 'Edit Class' screen appears (see Figure 4.79).

e. Enter 100 Kbps in the Reserved Tx/Rx Bandwidth field.

f. Leave all other fields at their default values.

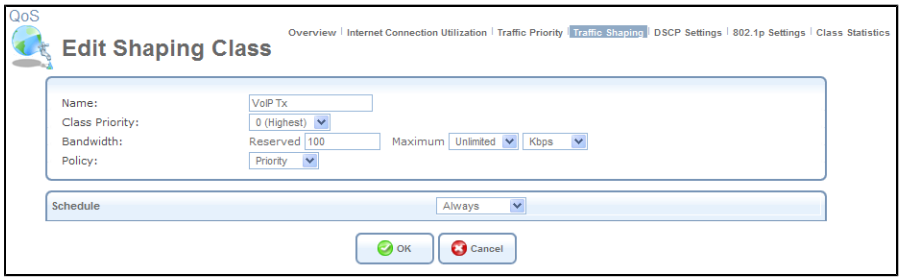

Figure 4.79 Edit Shaping Class

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g. Click 'OK' to save the settings.

h. Click 'OK' once more in the 'Edit Device Traffic Shaping' screen to save all settings.

5. Define and associate class rules:

a. Click 'Traffic Priority' under the 'QoS' tab in the 'Services' screen. The 'Traffic Priority' screen appears.

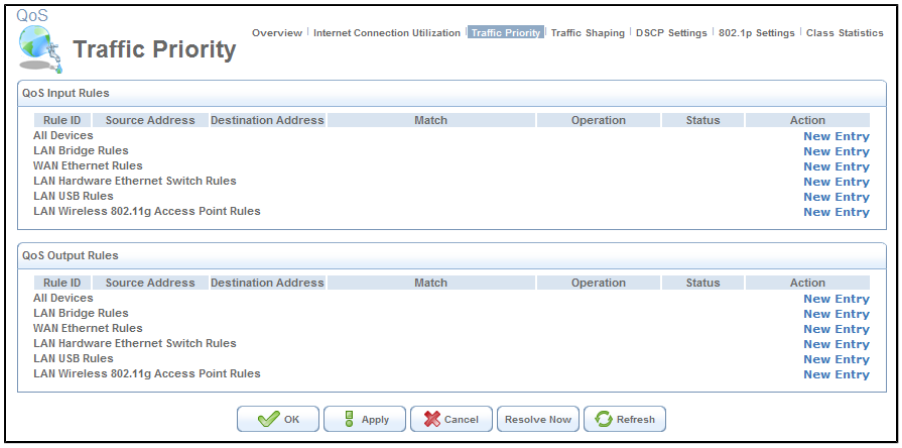
QoS
Traffic Priority
Overview | Internet Connection Utilization | Traffic Priority | Traffic Shaping | DSCP Settings | 802.1p Settings | Class Statistics
QoS Input Rules
Rule ID | Source Address | Destination Address | Match | Operation | Status | Action
All Devices
LAN Bridge Rules
WAN Ethernet Rules
LAN Hardware Ethernet Switch Rules
LAN USB Rules
LAN Wireless 802.11g Access Point Rules
New Entry
QoS Output Rules
Rule ID | Source Address | Destination Address | Match | Operation | Status | Action
All Devices
LAN Bridge Rules
WAN Ethernet Rules
LAN Hardware Ethernet Switch Rules
LAN USB Rules
LAN Wireless 802.11g Access Point Rules
New Entry
OK
Apply
Cancel
Resolve Now
Refresh

Figure 4.80 Traffic Priority

b. Click the 'New Entry' link of the 'WAN Ethernet Rules' under the 'QoS Output Rules' section. The 'Add Traffic Priority Rule' screen appears.

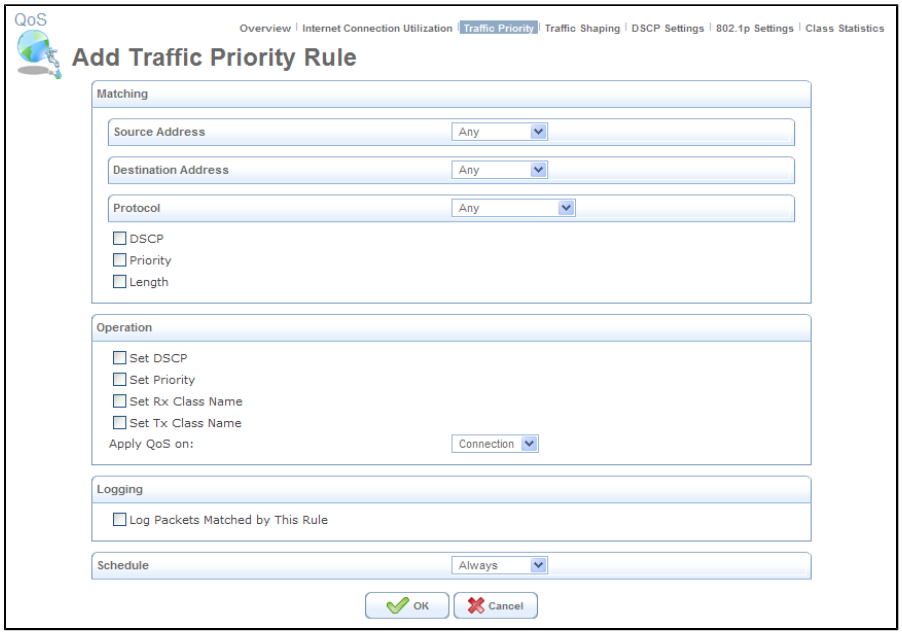

Figure 4.81 Add Traffic Priority Rule

c. In the 'Matching' section, select 'Show All Services' from the 'Protocol' drop-down menu, and then select "SIP". The screen will refresh displaying the protocol parameters (see Figure 4.82).

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d. In the 'Operation' section, check the 'Set Rx/Tx Class Name' check boxes, and select 'VoIP Rx/Tx' from the drop-down menus that appear.

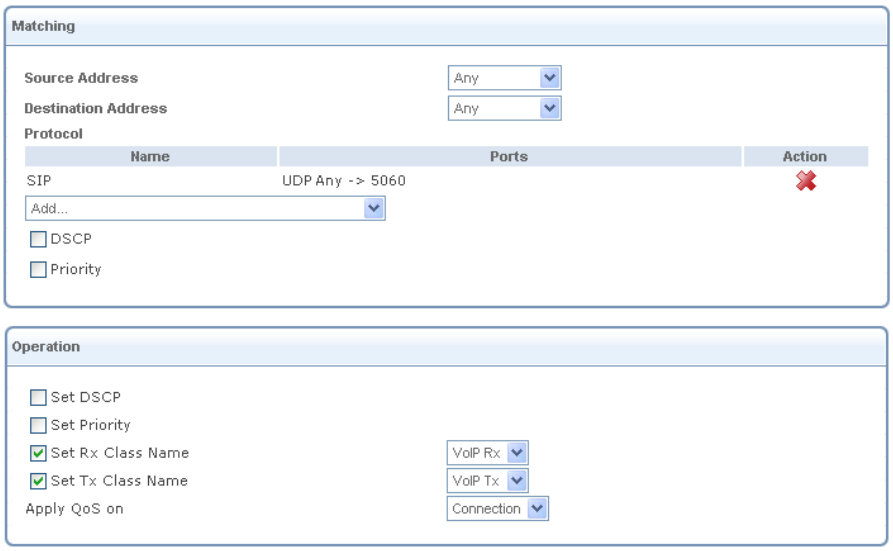

Figure 4.82 Add Traffic Priority Rule – SIP Protocol

e. Leave all other fields at their default values, and click 'OK' to save the settings.

4.3.8.3.1 Implementing the WRR Class Policy in VoIP's QoS

The WRR class policy enables you to fine-tune your Tx traffic priority settings. For instance, in a scenario where you utilize more than one VoIP protocol (for example, SIP and H.323), you can further prioritize VoIP's Tx traffic. In the following example, the SIP protocol is given preference over H.323. Therefore, you may assign 70% of the VoIP bandwidth to the SIP-based traffic, and 30% to the H.323-based traffic. To enable the WRR class policy, perform the following:

1. In the 'Edit Device Traffic Shaping' screen (see Figure 4.78), click the 'VoIP Tx' link. The 'Edit Shaping Class' screen appears (see Figure 4.79).

2. From the 'Policy' drop-down menu, select the WRR option. The screen refreshes, and a new section called 'Subclasses' is added.

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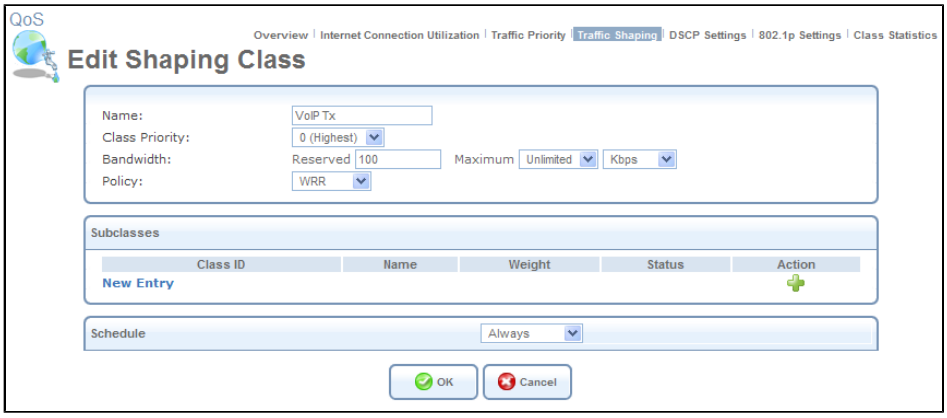

Figure 4.83 Subclasses Section in Edit Shaping Class

3. In the 'Subclasses' section, click either the 'New Entry' link or the action icon . The 'Add Shaping Class' screen appears.

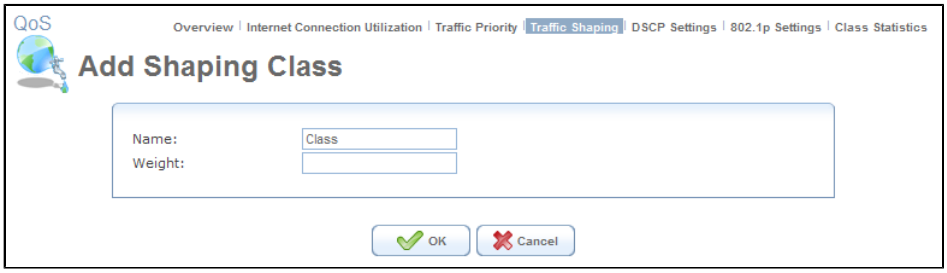

Figure 4.84 Add Shaping Class

This time, the screen contains two fields: 'Name' and 'Weight'.

4. In the 'Name' field, enter 'SIP' for the name of a VoIP's subclass assigned to the SIP-based traffic.

5. In the 'Weight' field, enter a numeric value that correlates with the amount of bandwidth you want to grant to the subclass. In the current example, the subclass is granted 70% of VoIP's Tx traffic. Therefore, enter **7** in the 'Weight' field.

> Note: The class weight range is between 1 and 10000.

6. Click 'OK' to save the settings.

Repeat the same procedure for creating the H.323 subclass of VoIP. However, in the 'Weight' field enter **3** that corresponds to 30% of the VoIP bandwidth you want to assign to the H.323 subclass.

> Note: When you activate the WRR class policy, it is not mandatory to define an Rx shaping class and its priority rules.

Once the subclasses are created, define the priority rules for the subclasses, as follows:

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1. Click 'Traffic Priority' under the 'QoS' tab in the 'Services' screen. The 'Traffic Priority' screen appears (see Figure 4.80).

2. Click the 'New Entry' link of the 'WAN Ethernet Rules' under the 'QoS Output Rules' section. The 'Add Traffic Priority Rule' screen appears (see Figure 4.81).

3. In the 'Matching' section, select 'Show All Services' in the 'Protocol' drop-down menu, and then select 'SIP'. The screen refreshes displaying the protocol parameters.

> Note: You can also define the 'SIP' protocol manually, as described in Section 4.3.8.3.

4. In the 'Operation' section, check the 'Set Tx Class Name' check box, and select 'SIP' in the drop-down menu that appears.

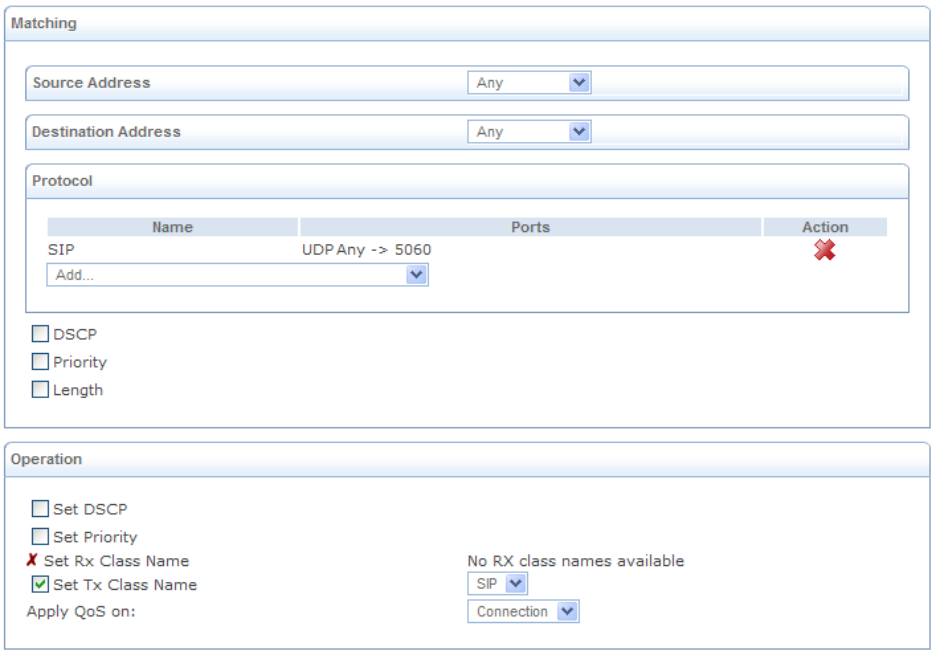

Figure 4.85 Add Traffic Priority Rule # SIP Protocol

5. Leave all other fields at their default values, and click 'OK' to save the settings.

Repeat the same procedure for defining a priority rule for the H.323 subclass. The only difference is that you should select the 'H.323 Call Signaling' value for the protocol settings, and 'H.323' for the Tx class name.

4.3.8.4 Running the Scenario

1. Initiate a direct call (using the SIP protocol) from one IP phone to the other. For VoIP configuration, refer to Section 4.5. Verify that the conversation can be conducted clearly and adequately.

2. Initiate an FTP file upload from the LAN computer to the WAN computer. This can be done using the Windows command line. Use the **hash** command to utilize the pound

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sign process indicator before starting the file transfer. As soon as the upload commences, your ability to transmit voice will be lost—the WAN party will not be able to hear you. The upload, on the other hand, will be proceeding rapidly, taking up all of your transmit bandwidth (see Figure 4.86).

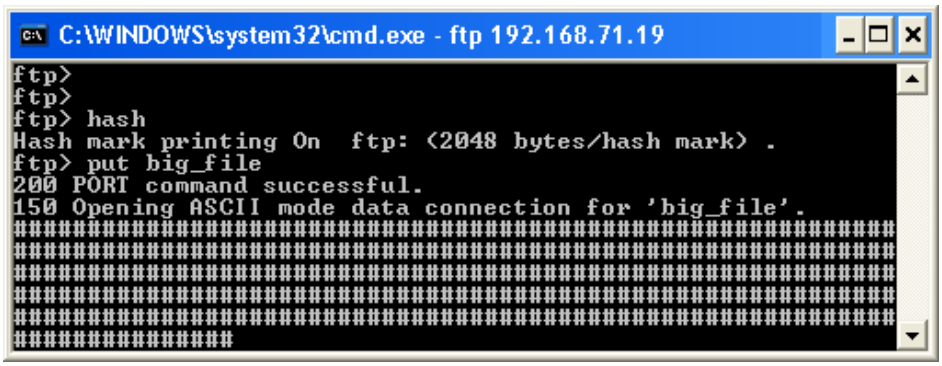
C:\WINDOWS\system32\cmd.exe - ftp 192.168.71.19
ftp>
ftp>
ftp> hash
Hash mark printing On ftp: (2048 bytes/hash mark) .
ftp> put big_file
200 PORT command successful.
150 Opening ASCII mode data connection for 'big_file'.

Figure 4.86 FTP Process

3. Activate QoS to restore the voice transmission:

   a. Under the 'QoS' menu item, click 'Traffic Shaping'. The 'Traffic Shaping' screen appears.

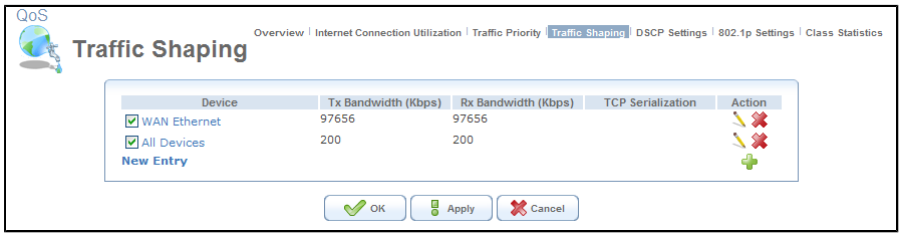

Figure 4.87 Traffic Shaping

   b. Click the Device name, in this case 'All devices', and check both entries in the Class ID column to enable the classes (see Figure 4.88).

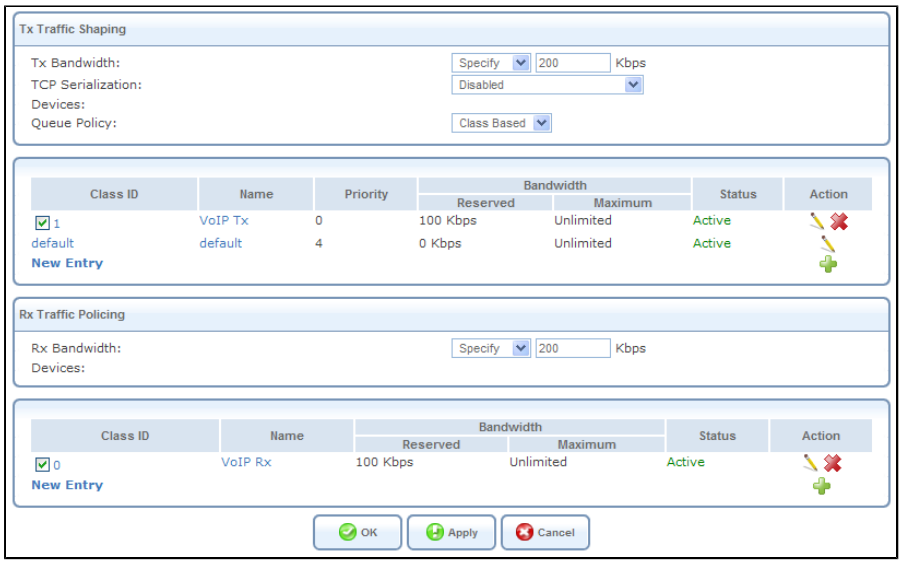

Figure 4.88 Shaping Classes – Check the Class ID

c. Click 'OK' to save the settings.

The transmission capability will be restored, as most of the bandwidth will now be reserved for the VoIP stream. The file upload rate, on the other hand, will obviously slow down.

Note: Some IP phones and ATA devices are preconfigured to send DSCP-marked data. OpenRG will handle such data with QoS priority, even if a QoS class is not configured for the VoIP stream. To run the above scenario successfully, you must first disable DSCP marking on such devices.

4.3.9 Example: Providing Priority to an IPTV Stream

This section presents a scenario in which the WAN bandwidth is shaped to provide priority to a media broadcast (for example, an IPTV stream). When your bandwidth is shared between a media stream and data transfer, a greater portion of it will normally be used by the data transfer, reducing the quality of the media broadcast or even disrupting it. With the help of OpenRG's Traffic Shaping feature, the media stream receives the priority it requires, thereby maintaining its quality. This scenario is based on the following real-life case.

Assume that you have a 100 Mbps Ethernet LAN with a 100 Mbps WAN interface router. The router communicates with the ISP network via a modem that has a 2Mbps bandwidth, and does not have a QoS module. When OpenRG's Traffic Shaping feature is disabled, the router sends traffic to the modem as fast as it is received from the LAN host. This typical configuration makes the modem a bottleneck. However, if you enable Traffic Shaping on the router, it will limit the router's bandwidth, artificially forcing it to be the bottleneck. This configuration creates a regulated traffic queue that enables the router to accept uneven and bursty flows of packets and transmit them in a steady, predictable stream.

4.3.9.1 Simulating Limited Bandwidth and IPTV Setup

As a first step, simulate limited bandwidth by reducing OpenRG's Rx/Tx bandwidth in the following way:

1. Under the 'Services' tab, click 'QoS'. The following screen appears.

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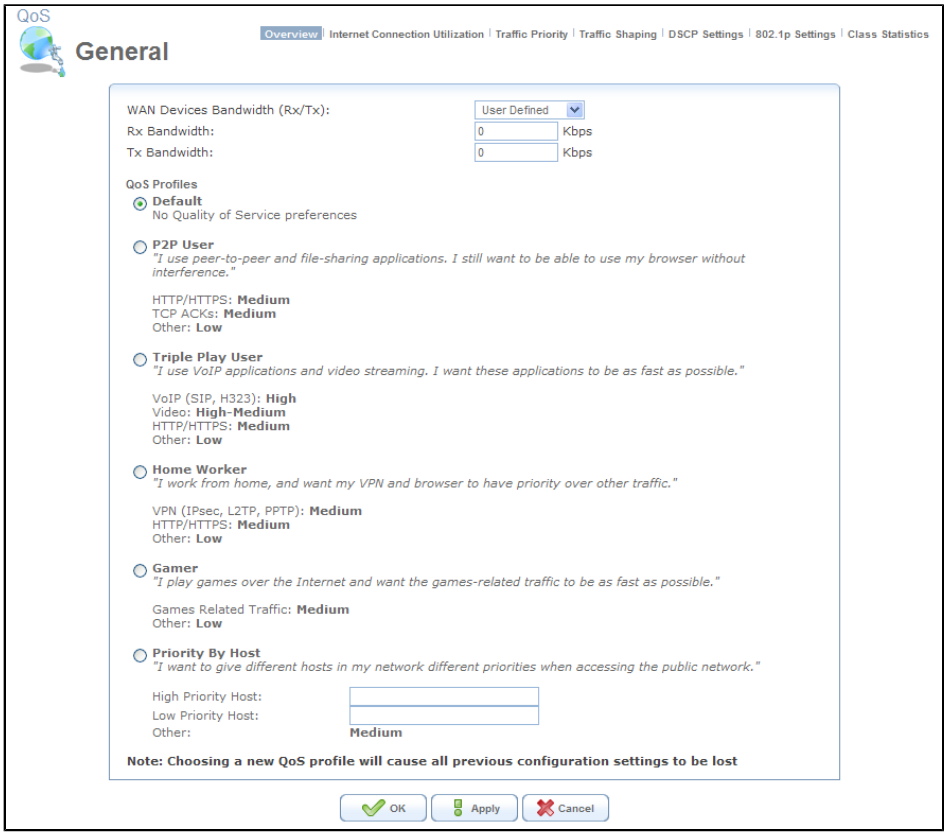

Figure 4.89 General

2. From the 'WAN Devices Bandwidth(Rx/Tx)' drop-down menu, select 5000/256 Kbps.

3. Click 'OK' to save the settings.

To simulate an IPTV setup, use the *Video LAN Client* (VLC) application. VLC supports both Client and Server modes. In its server mode, VLC can be used on a WAN host as the broadcaster, which sends a video stream to a multicast group. In its client mode, VLC can be used as a media player on a LAN host. VLC uses a multicast IP address range between 224.0.0.0 – 239.255.255.255. It can be installed both on Linux and Windows computers. You can download VLC from http://www.videolan.org/vlc/download-windows.html.

To configure the VLC server, perform the following:

1. In VLC's 'File' menu, select 'Wizard'. The following screen appears.

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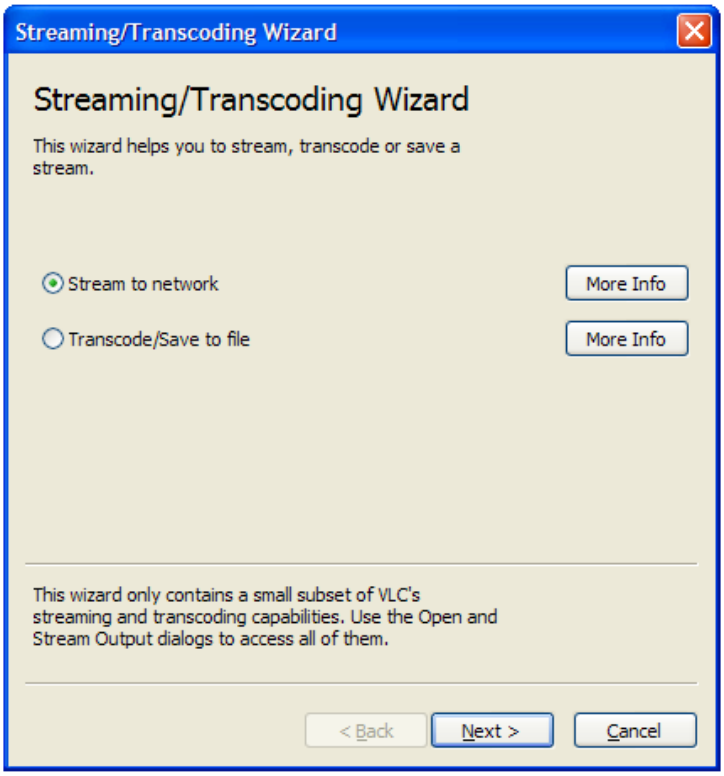
Streaming/Transcoding Wizard
Streaming/Transcoding Wizard
This wizard helps you to stream, transcode or save a stream.
Stream to network
More Info
Transcode/Save to file
More Info
This wizard only contains a small subset of VLC's streaming and transcoding capabilities. Use the Open and Stream Output dialogs to access all of them.
< Back
Next >
Cancel

Figure 4.90 Streaming/Transcoding Wizard

2. Select the 'Stream to Network' radio button and click 'Next'. The 'Input' screen appears.

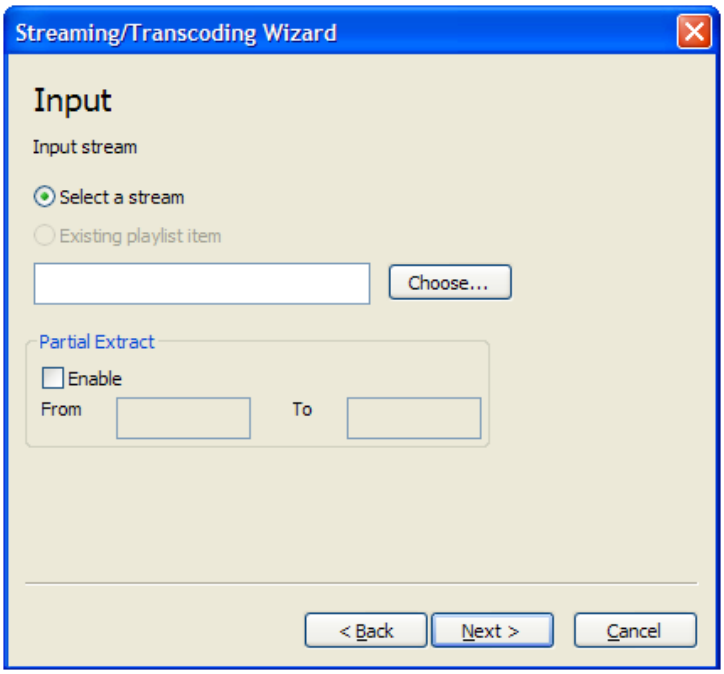

Figure 4.91 Input

3. Verify that the 'Select a stream' radio button is selected, and click 'Choose'. The following dialog box appears.

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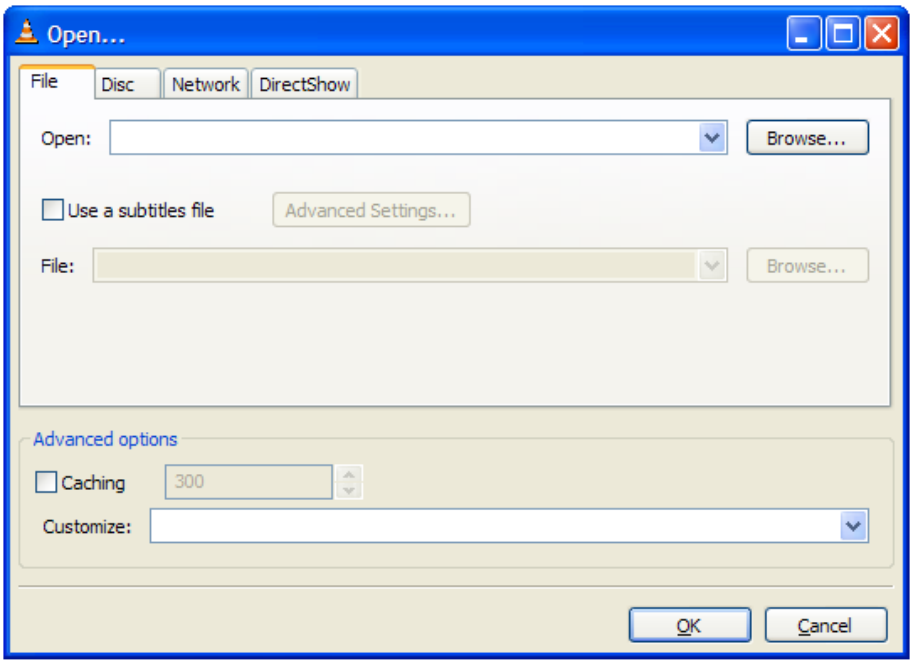

Figure 4.92 File Selection Dialog Box

4. Click 'Browse', and select the video file you would like to stream.

5. Click 'OK', and then 'Next'. The 'Streaming' screen appears.

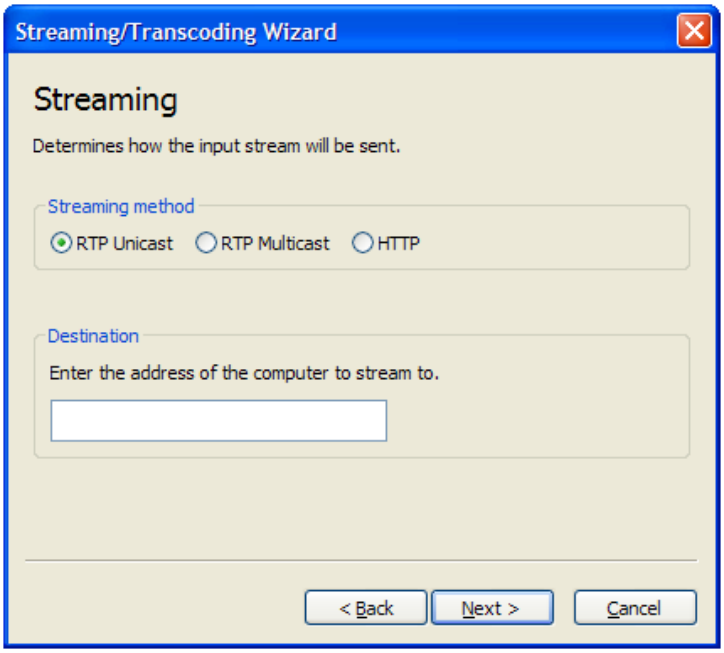

Figure 4.93 Streaming

6. Under 'Streaming method', select 'RTP Multicast'.

7. In the 'Destination' field, enter the multicast group IP address (between 224.0.0.22 – 224.0.0.102).

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8. Click 'Next'. The 'Encapsulation format' screen appears.

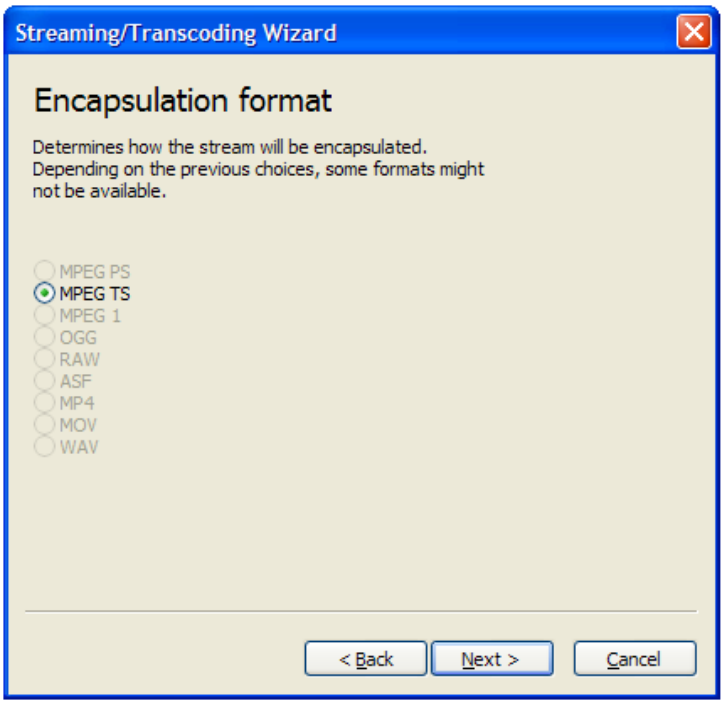

Figure 4.94 Encapsulation format

9. Verify that the 'MPEG TS' radio button is selected, and click 'Next'. The 'Additional streaming options' screen appears.

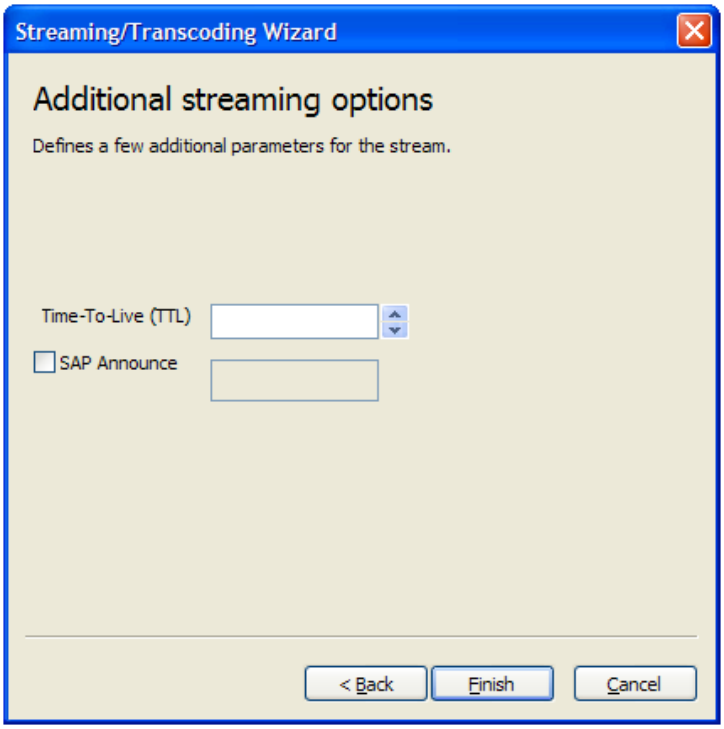

Figure 4.95 Additional streaming options

10. Set the 'Time-To-Live (TTL)' parameter to be greater than five (depends on the number of network hops).

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11. Click 'Finish' to exit the wizard.

To configure the VLC client, perform the following:

1. From the 'File' menu, select 'Open Network Stream'. The following screen appears.

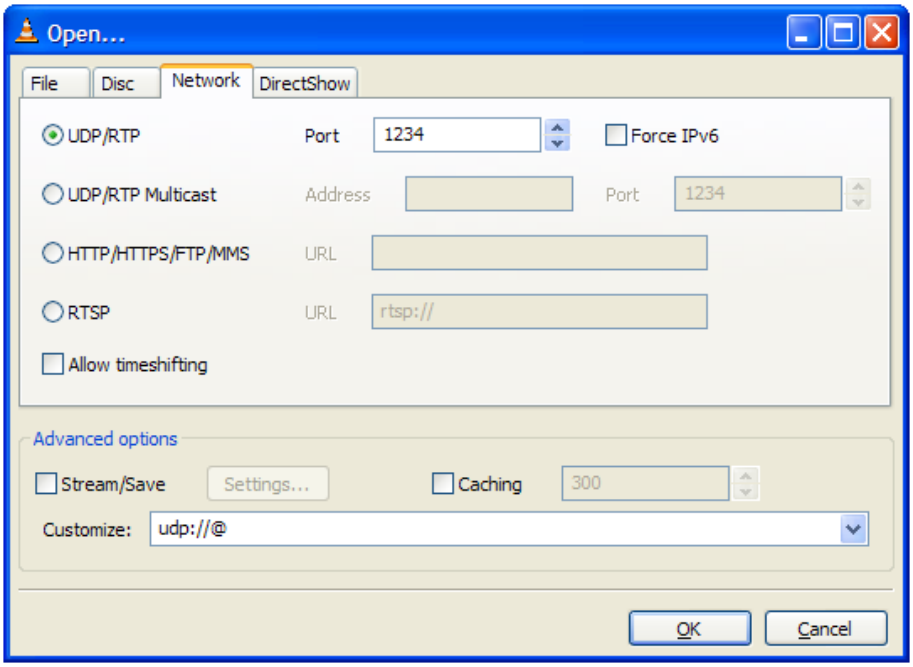

Figure 4.96 Network

2. Select the 'UDP/RTP Multicast' radio button, and enter the multicast group address (as defined in the VLC server) in the 'Address' text box that opens.

3. Click 'OK' to save the settings.

While watching the video on the LAN PC, load the network by downloading a large file from the WAN using FTP. Run the FTP's **hash** command to visualize the file download speed. The video and sound stream quality will noticeably degrade.

4.3.9.2 Using QoS for Improving the Streaming Quality

To improve the media stream quality, perform the following:

1. Designate a protocol and a specific port number for the media stream:

    a. In OpenRG's WBM, click the 'Advanced' tab and select 'Protocols'. The 'Protocols' screen appears.

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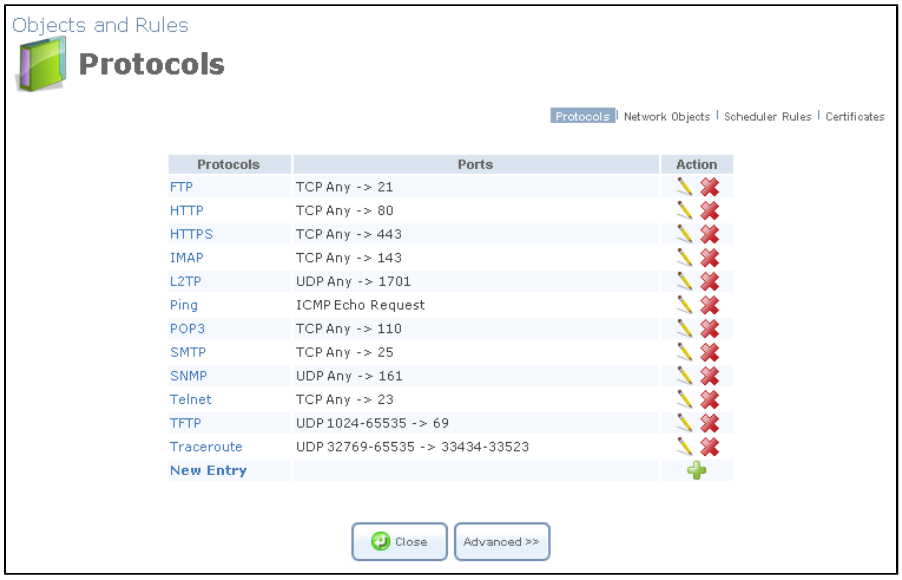

Figure 4.97 Protocols

This screen displays a list of preset and user-defined applications and common port settings. You may add new protocols to support new applications or edit existing ones according to your needs. For more information, refer to the 'Protocols' section of the OpenRG Administrator Manual.

b. Click the 'New Entry' link. The 'Edit Service' screen appears.

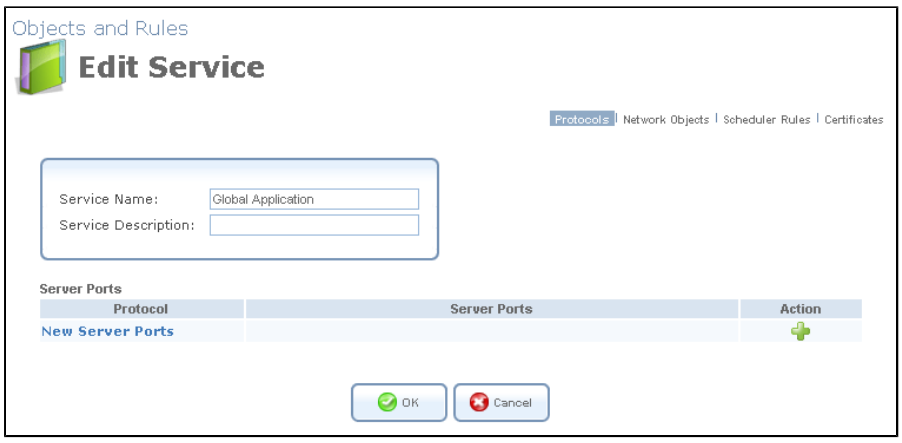

Figure 4.98 Edit Service

c. Change the default service name to 'IPTV', and click the 'New Server Ports' link. The 'Edit Service Server Ports' screen appears.

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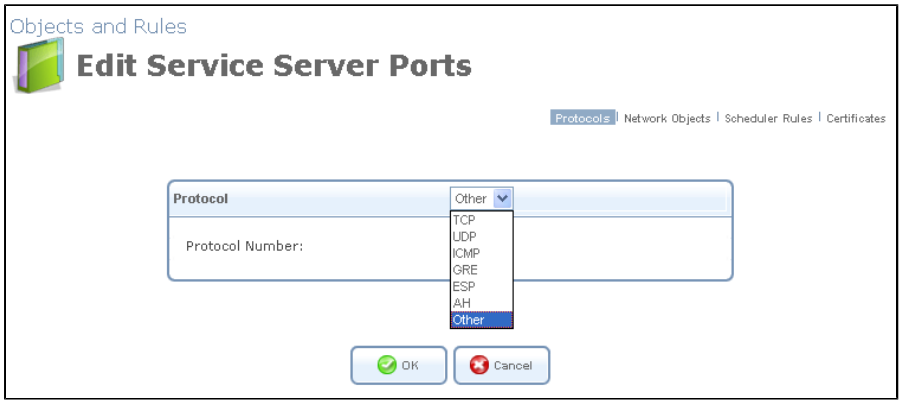

Figure 4.99 Edit Service Server Ports

d. From the 'Protocol' drop-down menu, select 'UDP'. The screen refreshes, changing to the following.

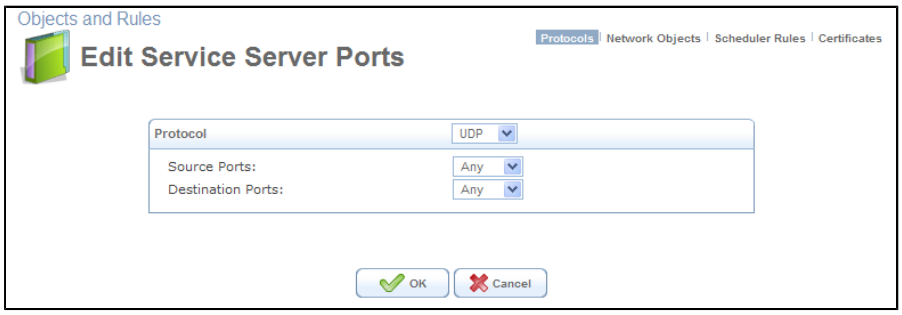

Figure 4.100 Edit Service Server Ports – UDP

e. From the 'Source Ports' drop-down menu, select 'Any'.

f. From the 'Destination Ports' drop-down menu, select 'Single' and enter port 1234 (the default port to which VLC sends the media stream).

g. Click 'OK' to save the settings.

2. Create a traffic shaping class ID:

a. Under the 'Services' tab, click the 'QoS' menu item and select 'Traffic Shaping'. The 'Traffic Shaping' screen appears, displaying the bandwidth you have set on the default WAN device.

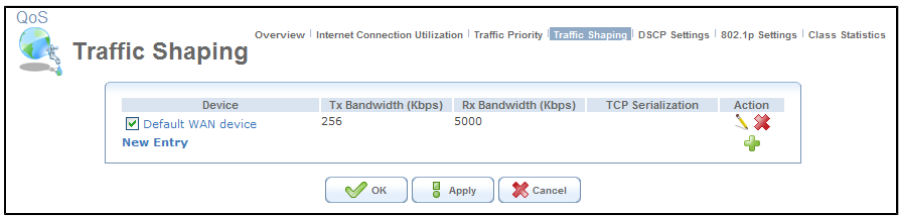

Figure 4.101 Traffic Shaping

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b. Click the 'Default WAN device' link or its action icon . The 'Edit Device Traffic Shaping' screen appears.

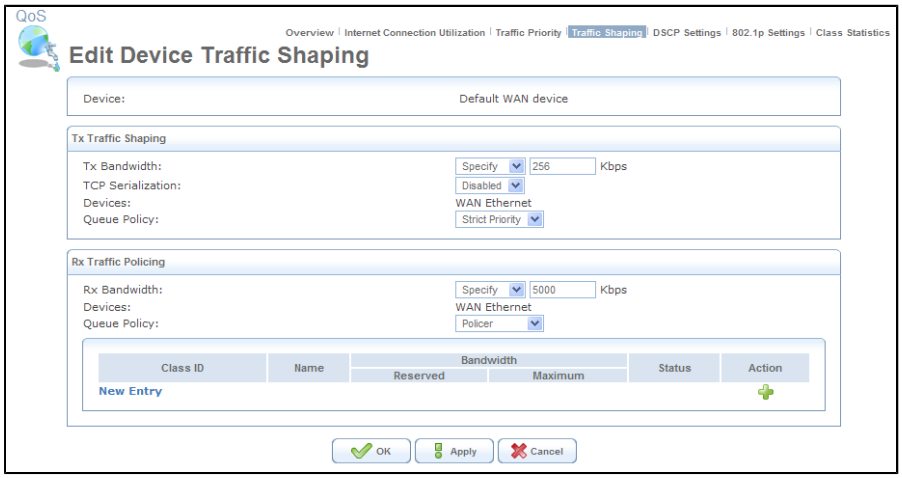

Figure 4.102 Edit Device Traffic Shaping

c. Under 'Class ID', click the 'New Entry' link. The 'Add Policing Class' screen appears.

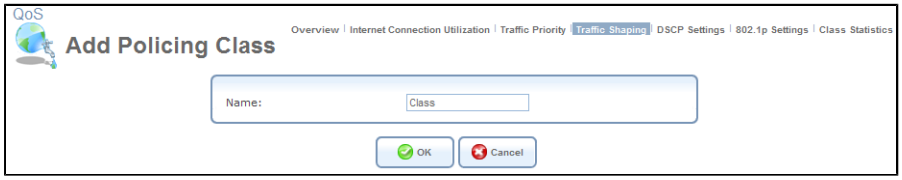
QoS
Add Policing Class
Overview | Internet Connection Utilization | Traffic Priority | Traffic Shaping | DSCP Settings | 802.1p Settings | Class Statistics
Name:
Class
OK
Cancel

Figure 4.103 Add Policing Class

d. Change the default class name to 'IPTV', and click 'OK'. The 'Edit Device Traffic Shaping' screen appears with the IPTV class entry displayed in the 'Rx Traffic Policing' section.

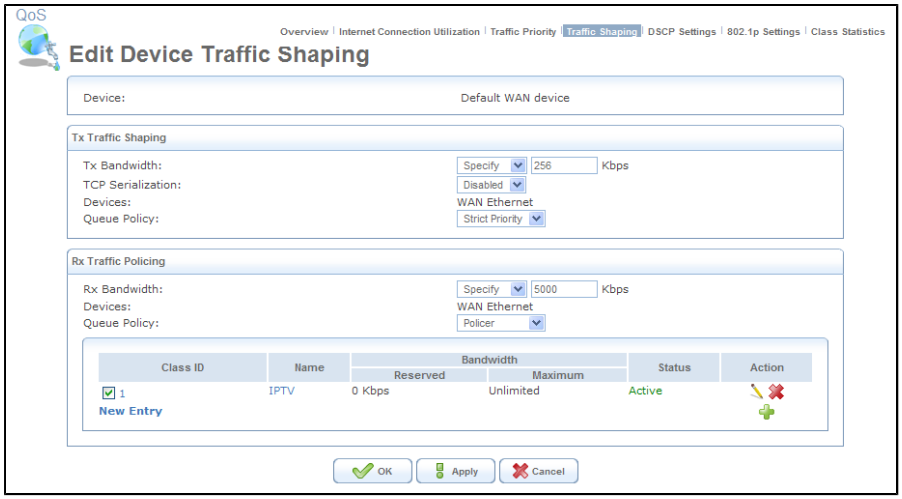

Figure 4.104 Edit Device Traffic Shaping – IPTV Class

e. Click the 'IPTV' link or its action icon . The 'Edit Policing Class' screen appears.

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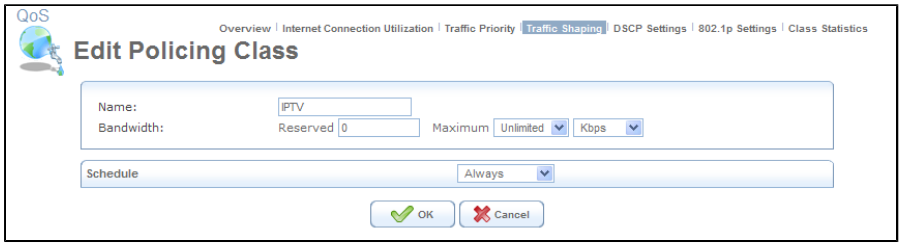

Figure 4.105 Edit Policing Class – IPTV

f. In the 'Reserved' field of the 'Bandwidth' parameter, enter 3000 and click 'OK'. You will be redirected back to the 'Edit Device Traffic Shaping' screen (see Figure 4.104). The bandwidth reserved for the IPTV will be displayed in its respective field.

3. As the last step, define a priority rule for the incoming traffic:

a. Under the 'QoS' menu item, click 'Traffic Priority'. The corresponding screen appears.

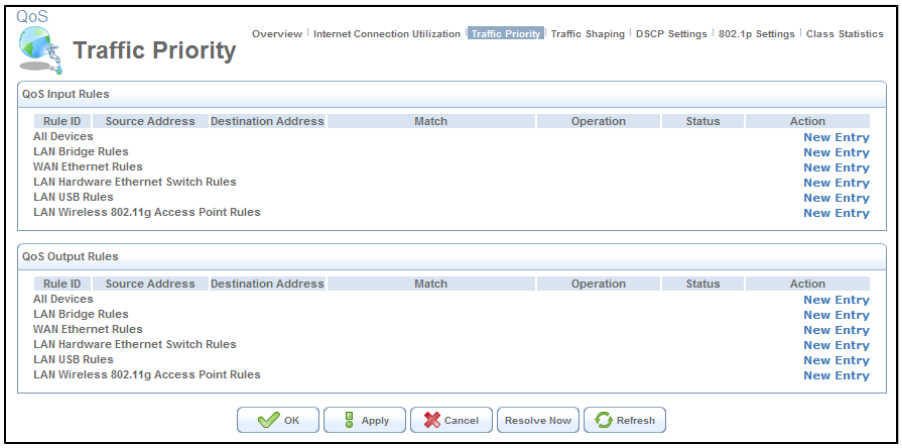
QoS
Traffic Priority
Overview | Internet Connection Utilization | Traffic Priority | Traffic Shaping | DSCP Settings | 802.1p Settings | Class Statistics
QoS Input Rules
Rule ID | Source Address | Destination Address | Match | Operation | Status | Action
All Devices
LAN Bridge Rules
WAN Ethernet Rules
LAN Hardware Ethernet Switch Rules
LAN USB Rules
LAN Wireless 802.11g Access Point Rules
New Entry
QoS Output Rules
Rule ID | Source Address | Destination Address | Match | Operation | Status | Action
All Devices
LAN Bridge Rules
WAN Ethernet Rules
LAN Hardware Ethernet Switch Rules
LAN USB Rules
LAN Wireless 802.11g Access Point Rules
New Entry
OK
Apply
Cancel
Resolve Now
Refresh

Figure 4.106 Traffic Priority

b. In the 'Qos Input Rules' section, click the 'New Entry' link of the 'WAN Ethernet Rules' item. The 'Add Traffic Priority Rule' screen appears.

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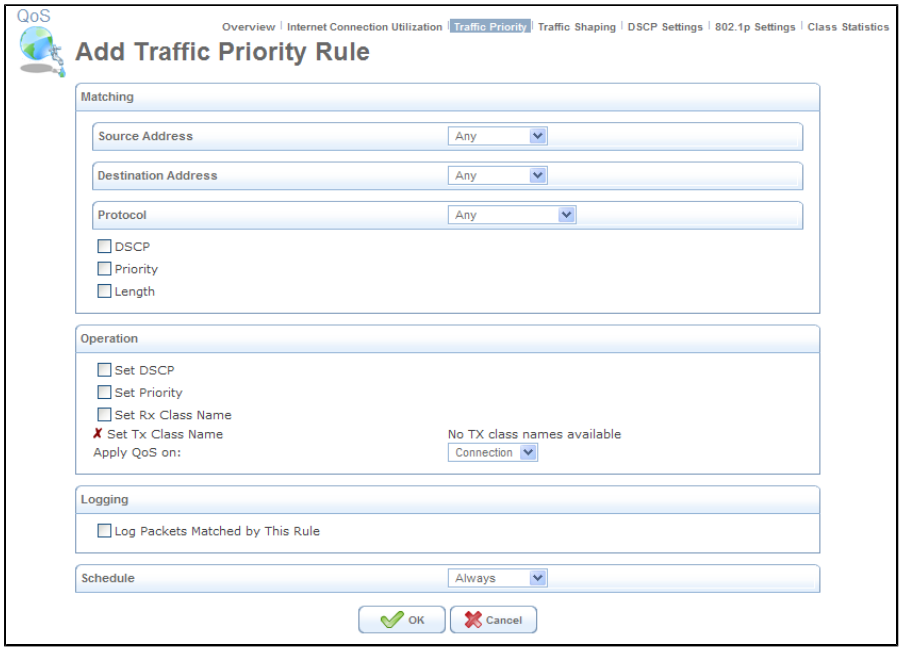

Figure 4.107 Add Traffic Priority Rule

c. From the 'Protocol' drop-down menu, select 'IPTV' (if it is not displayed, select 'Show All Services'). The screen refreshes, displaying the IPTV protocol entry.

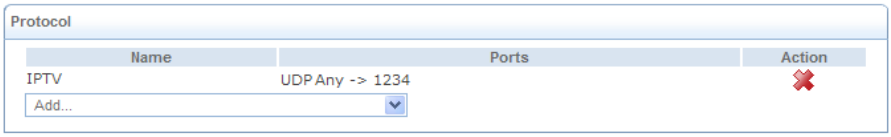

Figure 4.108 Add Traffic Priority Rule – IPTV Protocol

d. Under 'Operation', select the 'Set Rx Class Name' check box. The screen refreshes, displaying the IPTV Rx class.

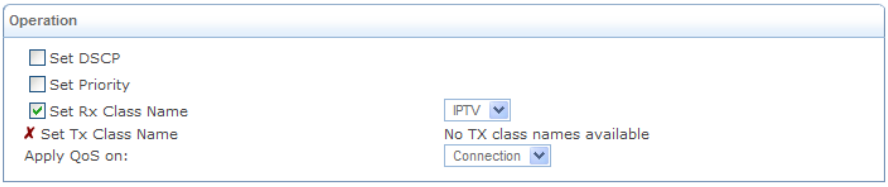

Figure 4.109 Add Traffic Priority Rule – IPTV Rx Class

e. Click 'OK' to save the settings.

Restart the video stream on the LAN while downloading a large file from the WAN using FTP. You will notice that the video stream has no disruptions, while the file download speed slows down slightly.

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4.4 Sharing Your Media with the Home Network

OpenRG's Media Sharing solution enables you to share and stream media files from a storage device connected to OpenRG. You can access the shared media files with either a network-aware Consumer Electronic (CE) device, as described in Section 4.4.2, or from a LAN PC with an installed media rendering software, as described in Section 4.4.3. Both methods utilize a Universal Plug and Play (UPnP) media renderer.

4.4.1 Configuring the Media Sharing Service

Configure OpenRG's media sharing service by clicking its menu item under the 'Services' tab. The 'Media Sharing' screen appears.

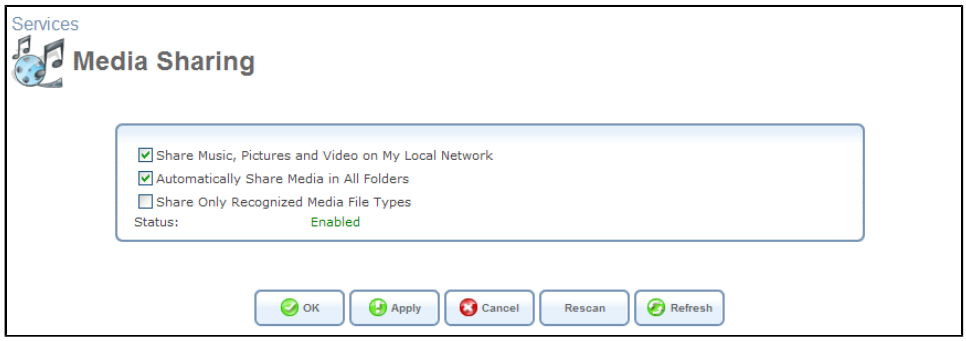

Figure 4.110 Media Sharing

The 'Media Sharing' screen contains the following options:

Share Music, Pictures and Video on My Local Network By default, this option is selected. To disable media sharing, deselect this option, and click 'Apply'.

Automatically Share Media in All Folders By default, this option is selected, causing all partitions and folders on the storage device to become shared automatically. OpenRG automatically scans the storage device for media files, and displays folders containing such files in the 'Local Folders' section of this screen. To disable the automatic sharing and manually share a specific partition or folder, perform the following:

1. Deselect the 'Automatically Share Media in All Folders' check box and click 'Apply'. The screen refreshes.

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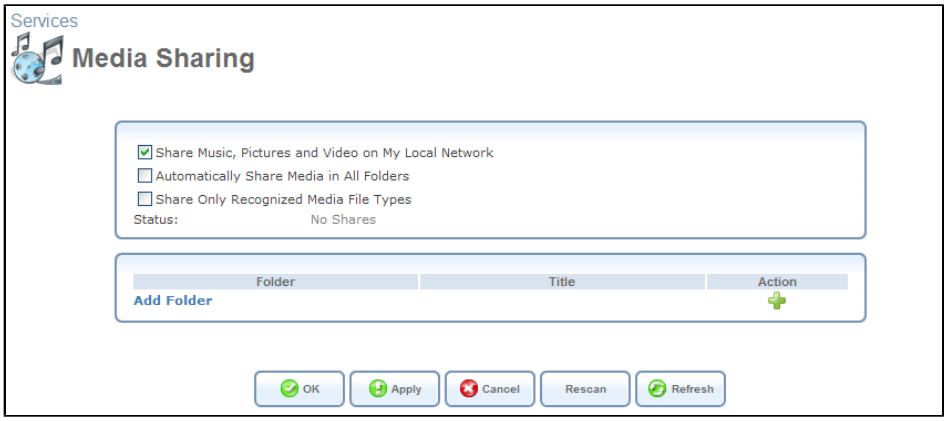

Figure 4.111 Manual Folder Sharing Mode

The 'Status' field changes to 'No Shares', and a new section appears, enabling you to create and manage a list of manually shared partitions and their folders.

2. Click the 'Add Folder' link, or the action icon . The 'Folder Settings' screen appears.

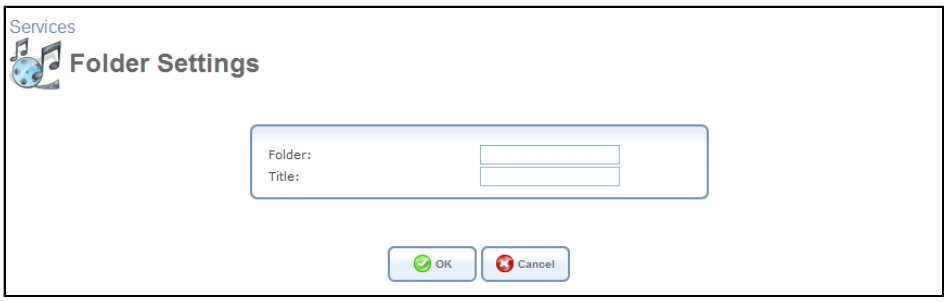

Figure 4.112 Folder Settings

3. In the 'Folder' field, enter the exact path (for example, **A/Music**, where 'A' is a partition's letter, and 'Music' is a folder on this partition).

> Note: The partition's letter cannot be changed. OpenRG automatically assigns a letter to a partition, once the storage device is connected. For more information, refer to Section 4.7.2.

4. In the 'Title' field, enter a descriptive title for the folder (for example, 'Pop Music'). Note that entering this information is mandatory.

5. Click 'OK' to save the settings. The 'Media Sharing' screen appears, displaying the shared partition. If necessary, repeat the same procedure to share additional partitions and their folders.

At any time, you can edit the partition or folder sharing settings by clicking its action icon . In addition, you can remove a partition or a folder from the shares list by clicking its action icon .

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Note: In case of changing the sharing settings, click the 'Rescan' button in the WBM's 'Media Sharing' screen before trying to access the shared media remotely. Clicking the 'Rescan' button updates the media database with the current shared media content and its path. The more disk space the media files occupy, the longer the scanning process may take.

OpenRG adds the **MEDIASRV.DB** file to all the writable partitions it identifies on the storage device. This is an index file that the media server uses to access the media files on the disk. Therefore, do not delete this file.

When adding or removing a media file via OpenRG's file server, the media database is updated automatically. However, if other file management utilities are used (for example, FTP) to add or remove a file, click the 'Rescan' button to update the database with the changes. Otherwise, OpenRG will update the database during its periodic scanning of the shared media, which is performed once every 24 hours.

4.4.2 Streaming Your Media to a TV via a Media Client Device

OpenRG enables you to share and stream media files (music, pictures, and video) from its storage device to a TV set, over a media client device. The following sections explain how to connect this device to a TV set and the gateway, as well as how to stream the shared media content.

4.4.2.1 Connecting a Media Client

A modern media client device includes a network-aware Universal Plug and Play (UPnP) media renderer. Typically, this device has an RCA or coaxial connection to the TV set, as well as a LAN socket and/or a wireless LAN interface for connecting to the gateway.

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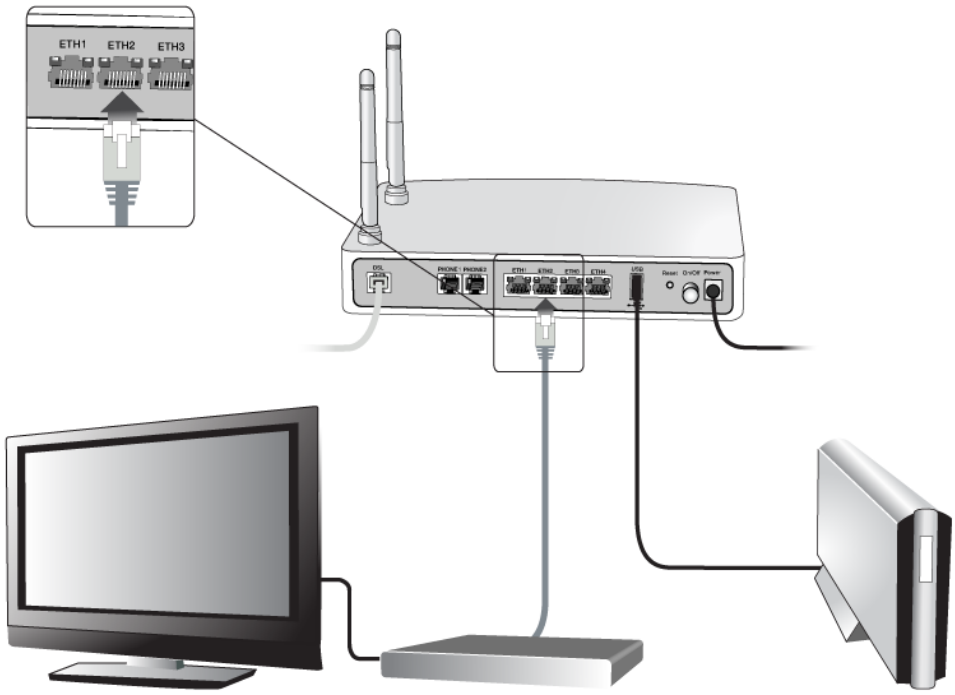

Figure 4.113 Media Client Device and Television Connection

1. Connect your TV set to the media client device according to the instructions provided with the device. Make sure you select the correct AV input on the TV set.

2. Connect the media client device to an available Ethernet port on your gateway.

> Note: If your media client device has a wireless capability, it can connect to OpenRG without cables. However, since media usage requires streaming high volumes of traffic, wireless use is recommended only if the media client device supports the 802.11n protocol.

4.4.2.2 Viewing and Streaming Media Files

Reception of OpenRG's media server broadcast by the media client device is automatic, requiring no further configuration.

1. Turn on the media client device. The following images represent the D-Link MediaLounge™ media client menu, displayed on the TV set (connected to the device).

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Figure 4.114 MediaLounge Main Screen

2. Use the device's remote control to select 'My Media'. The path letter of the OpenRG share (which contains your disk content) appears.

Figure 4.115 Your Share on OpenRG

3. Select the share. The share's content is displayed.

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Figure 4.116 Media Folders on a Share

Note: MediaLounge displays the same directory hierarchies as on the storage device.

4. Select a folder, for example "photos". The folder's content is displayed.

Figure 4.117 Media Files in the Shared Folder

5. Select a photo to display.

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Figure 4.118 Displaying a Photograph

In the same method, you can stream music and video files from your disk to your television.

4.4.3 Accessing the Shared Media from a LAN Computer

In this section, you will learn how to access your media content from any LAN computer, on which a media rendering client application is installed. One of such applications is **XBMC Media Center**. The following example utilizes XBMC to demonstrate how to access the shared media via a LAN computer.

After installing this application on your computer, perform the following:

1. Launch XBMC. Its main screen appears.

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Figure 4.119 XBMC Main Screen

2. Select the type of media you would like to view by clicking the corresponding link (either 'Videos', 'Music', or 'Pictures'). For example, select 'Music'. The following screen appears.

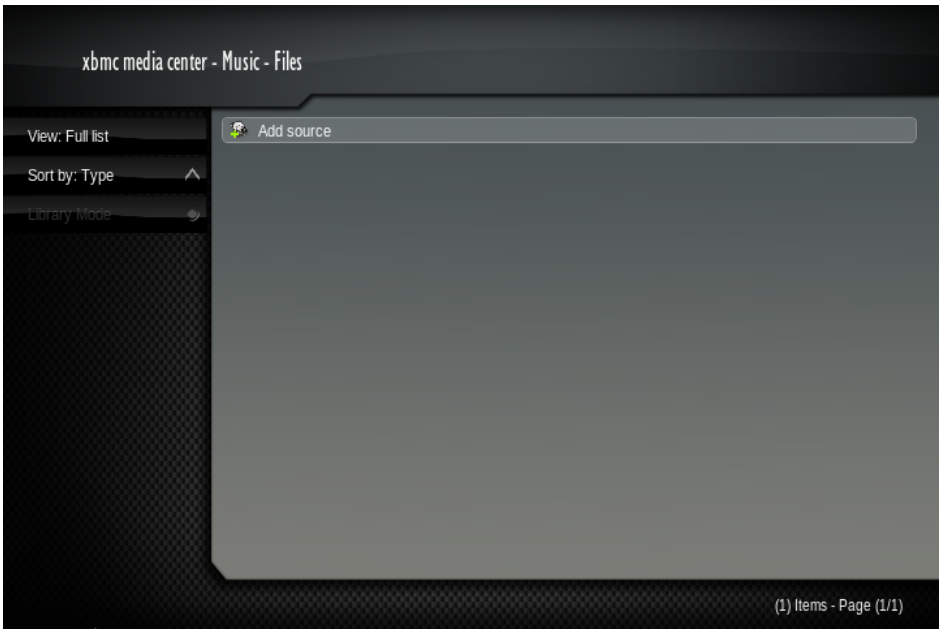

Figure 4.120 Add source

3. To obtain access to the desired media files, you must first define a path to the shared directory in which the files are stored. To do so, perform the following:

    a. Select 'Add source' (see Figure 4.120), and click the 'Browse' button in the next screen. The 'Browse for new share' dialog box appears.

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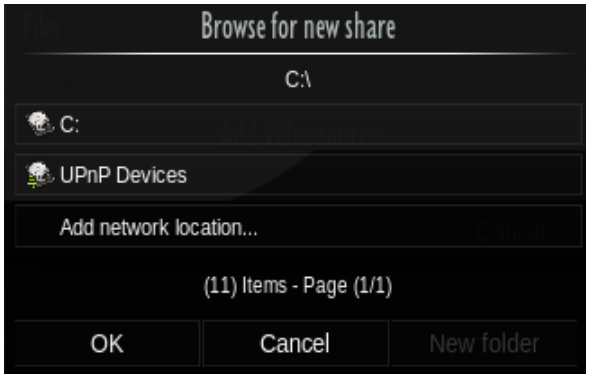

Figure 4.121 Browse for new share

b. Select the 'UPnP Devices' option. The following screen appears.

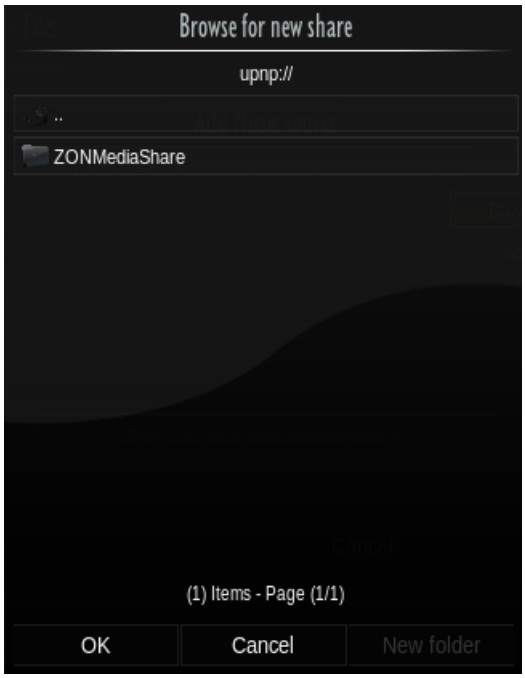

Figure 4.122 OpenRG's Media Server Link

The 'Jungo Media Server' link provides access to the storage device connected to OpenRG.

c. Click this link. After scanning your storage device for media content, XBMC displays the shared partition(s) on which it has detected media files.

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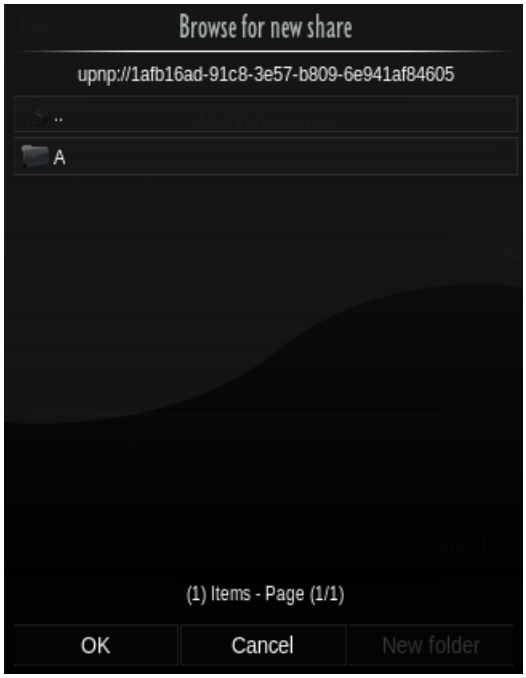

Figure 4.123 Shared Partition Containing Media Files

d. Click the partition's link. The shared media directories are displayed.

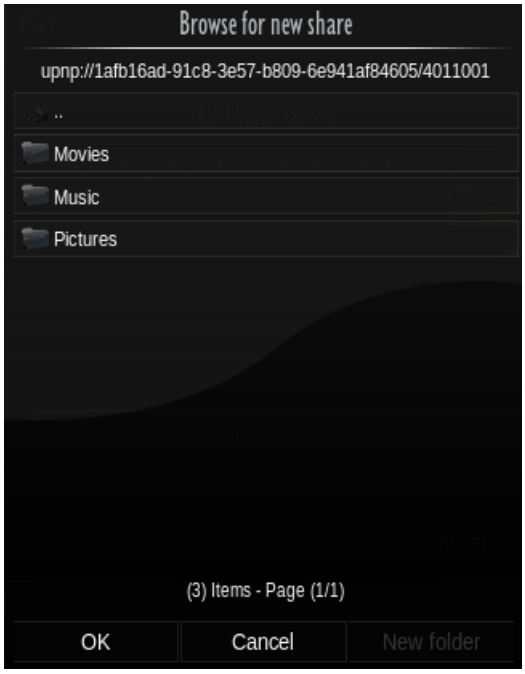

Figure 4.124 Media Directories on a Share

Note that XBMC displays the same directory hierarchies as on the storage device.

e. Select a directory in which the desired media files are located.

f. To save the path to the media directory, click 'OK' in the directory's 'Browse for new share' dialog box, and confirm in the next dialog box. This will create a shortcut

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(named 'Jungo Media Server') to the selected directory, enabling you to access the shared media from XBMC.

Figure 4.125 Jungo Media Server Shortcut

4. Click the 'Jungo Media Server' shortcut. A list of media files stored in the selected directory will be displayed.

xbmc media center - Music - Files
View: Full list
Sort by: Name
Library Mode
..
01-Quintet in B flat major, KV 174 - 4. Allegro 7.8 MB
02-Quintet in C major, KV 515 - 1. Allegro 12.5 MB
03-Quintet in C major, KV 515 - 2. Menuetto. Allegretto 7.9 MB
04-Quintet in C major, KV 515 - 3. Andante 12.4 MB
05-Quintet in C major, KV 515 - 4. Allegro 9.8 MB
(5) Items - Page (1/1)

Figure 4.126 Media Files in the Shared Directory

Note: In case the media directory specified in the path contains subdirectories, they will be displayed when clicking the 'Jungo Media Server' link. Select the desired subdirectory to display the files it contains.

5. Click a file's link to start playing it with XBMC.

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Similarly, perform the above procedure to define paths for the other types of media you would like to access.

4.5 Utilizing Telephony on Your Gateway

OpenRG's Analog Telephone Adapter (ATA) Voice solution enables you to connect multiple phones over a single broadband connection, providing the benefits and quality of digital Voice Over IP (VoIP). This solution enables you to place and receive calls over the Internet using a standard telephone set connected to OpenRG.

This section assumes that you have already connected your telephone equipment to the gateway, as described in the 'Connecting a Telephone' section of the OpenRG Quick Start Guide.

OpenRG provides two types of independent telephone usages: external calling—when the gateway is provisioned with SIP telephone lines, and internal communication within the home network.

Note: OpenRG's voice functionality is based on the Asterisk VoIP stack.

4.5.1 Configuring Your Telephone Line Services

Before using your telephone, configure the services available on its line according to your preferences. In the 'Line Settings' screen under the 'Voice' menu item, click the line's action icon . In the 'Services' section, select the services you would like to activate.

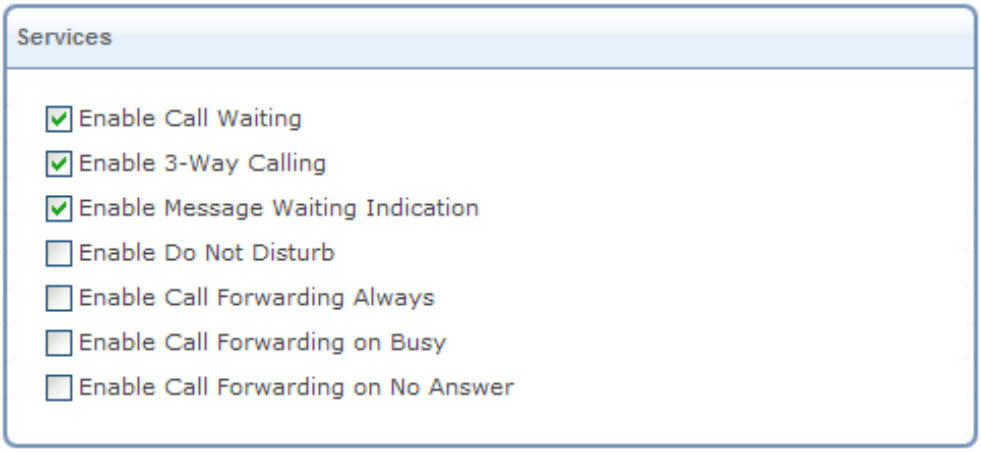

Figure 4.127 Line Settings – Services

Enable Call Waiting Select this check box to enable the Call Waiting feature.

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Enable 3-Way Calling Select this check box to allow all forms of three-way conversations. When this option is disabled you will not be able to place a call on hold, transfer a call or engage in a call conference.

Enable Message Waiting Indication Select this check box to play a special stutter tone whenever you receive a voice message.

Enable Do Not Disturb Select this check box to prevent calls from reaching your line. The caller will hear a busy tone. This feature can also be enabled or disabled by dialing *78 or *79 respectively.

Enable Call Forwarding Always Select this check box to forward incoming calls to another telephone number. The screen refreshes, displaying a field for entering the alternate number.

Figure 4.128 Enable Call Forwarding Always

This feature can also be enabled or disabled by dialing *72 (and the alternate number) or *73 respectively.

Enable Call Forwarding on Busy Select this check box to forward incoming calls to another telephone number when the line is busy. The screen refreshes, displaying a field for entering the alternate number.

Figure 4.129 Enable Call Forwarding on Busy

This feature can also be enabled or disabled by dialing *90 (and the alternate number) or *91 respectively.

Enable Call Forwarding on No Answer Select this check box to forward incoming calls to another telephone number if the call is not answered within a specific timeframe. The screen refreshes, displaying a field for entering the alternate number, and a field for determining the timeframe to ring before the call is forwarded.

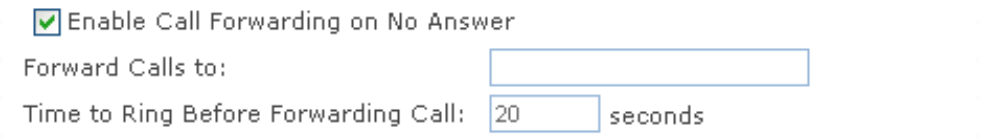

Figure 4.130 Enable Call Forwarding on No Answer

This feature can also be enabled or disabled by dialing *92 (and the alternate number) or *93 respectively.

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4.5.2 Operating Your Telephone

Following are several guidelines that will help you perform basic telephne operations.

- **Placing a Call**

  1. Pick up the handset of the phone (off-hook).
  2. Dial the extension number (both '#' and the number) or the remote party's number. To have the call sent out immediately, you may dial '#'.

- **Answering a Waiting Call**
  When the Call Waiting feature is enabled, you may receive a call while engaged in another call. When such call arrives, you will hear a call waiting tone.

  1. To answer a waiting call, press 'Flash'.
  2. 'Flash' may be used to switch back and forth between calls.

- **Blind Transfer**
  To transfer an existing call (B) to a third party (C) without consultation, perform the following:

  1. Press 'Flash'. Party B will now be placed on hold, and you will hear a dial tone.
  2. Dial *98. You should hear three short beeps followed by a dial tone.
  3. Dial party C's number. You should hear a high toned beep followed by two low toned beeps, followed by a dial tone. B is now initiating a call to C. You may now dial a new call or hang up the phone.

- **Call Transfer With Consultation**
  To transfer an existing call (B) to a third party (C), perform the following:

  1. Press 'Flash' on the phone. Party B will now be placed on hold, and you will hear a dial tone.
  2. Dial party C's number or a pre-configured speed dial number followed by '#' (you can engage in conversation).
  3. To complete the transfer, place the phone's handset on-hook.

- **3-Way Conference**
  To extend an existing call (B) into a 3-way conference by bringing in an additional party (C), perform the following:

  1. Press 'Flash' on the phone. Party B will now be placed on hold and you will hear a dial tone.

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2. Dial party C's number or a pre-configured speed dial number followed by '#' (you can engage in conversation).

3. Press 'Flash' to join both C and B to a single conference.

4. When you place the phone's handset on-hook, party B and party C will remain in conversation.

4.5.3 Configuring and Using Speed Dial

You can assign speed dial numbers to parties that you call frequently. Speed dial entries can be configured according to three types of destinations:

- **Proxy speed dial entry** This entry is intended for calling users that have an account with your telephone service provider.

1. Click the 'Speed Dial' link under the 'Voice' menu item. The 'Speed Dial' screen appears.

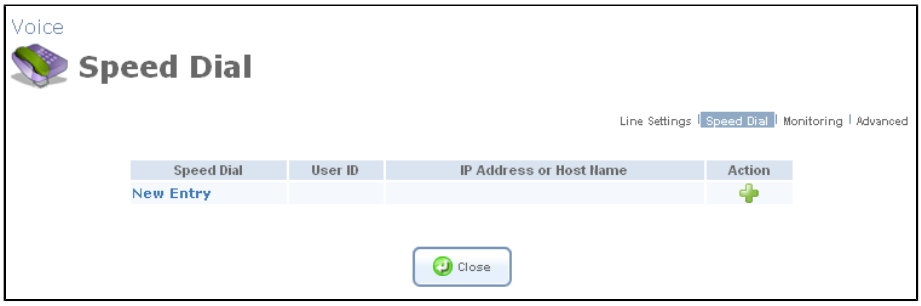

Figure 4.131 Speed Dial

2. Click the 'New Entry' link to add a new speed dial entry. The 'Speed Dial Settings' screen appears.

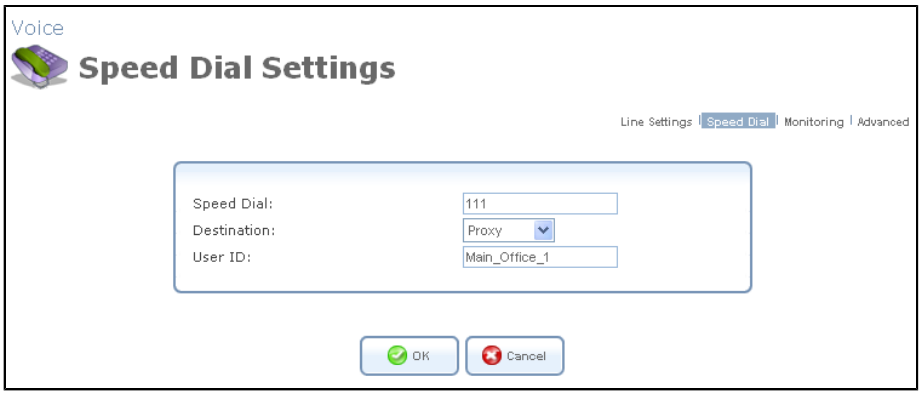

Figure 4.132 Speed Dial – via Proxy

3. Enter the following parameters:

Speed Dial A shortcut number that you will dial to call this party.

Destination The entry's destination, in this case a proxy.

User ID Specify the remote party's user ID (most commonly the telephone number).

4. Click 'OK' to save the settings.

- **Local line speed dial entry** This entry is intended for calling the other lines in your home network (local lines connected to your gateway).

1. In the 'Speed Dial' screen (see Figure 4.131), click 'New Entry' and select the 'Local Line' option from the drop-down menu. The screen refreshes.

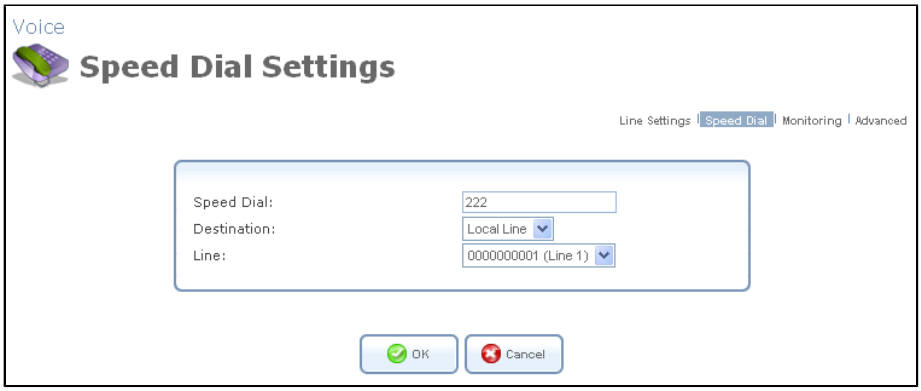

Figure 4.133 Speed Dial - Local Line

2. Enter the following parameters:

Speed Dial A shortcut number that you will dial to call this party.

Destination The entry's destination, in this case a local line.

Line The drop-down menu displays your pre-defined local lines. Select a destination line.

3. Click 'OK' to save the settings.

- **Direct call speed dial entry** This entry is intended for calling any telephone number over the Internet.

1. In the 'Speed Dial' screen (see Figure 4.131), click 'New Entry' and select the 'Direct Call' option from the drop-down menu. The screen refreshes.

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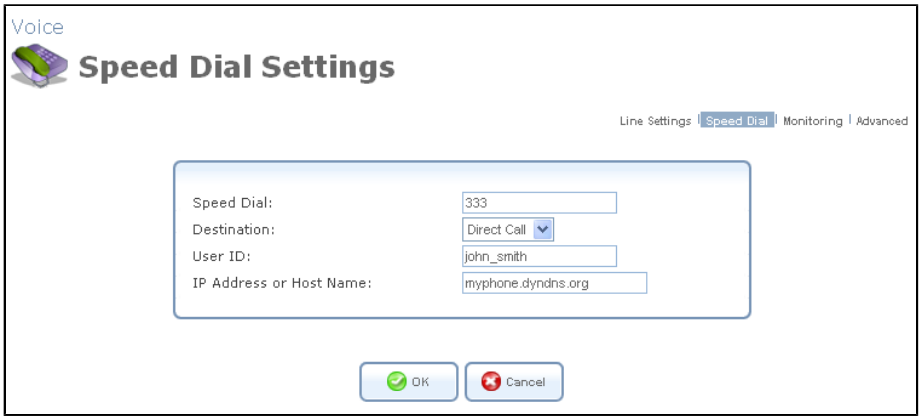

Figure 4.134 Speed Dial – Direct Call

2. Enter the following parameters:

   Speed Dial A shortcut number that you will dial to call this party.

   Destination The entry's destination, in this case a direct call.

   User ID Specify the remote party's user ID (most commonly the telephone number).

   IP Address or Host Name Specify the IP address or host name of the remote party's SIP client.

3. Click 'OK' to save the settings.

4.5.4 Sending a Fax

You can send and receive faxes over an OpenRG telephone line. Simply connect a fax machine to an active FXS telephone port on the gateway, and send the fax as you would from any other telephone.

Note: This feature is currently available on the Broadcom 96358 platform only.

Although you can send and receive faxes with the default settings, OpenRG enables you to configure the fax transmission method and codec. In the 'Line Settings' screen under the 'Voice' menu item, click the line's action icon . In the 'Fax Transmission' section, configure the following options.

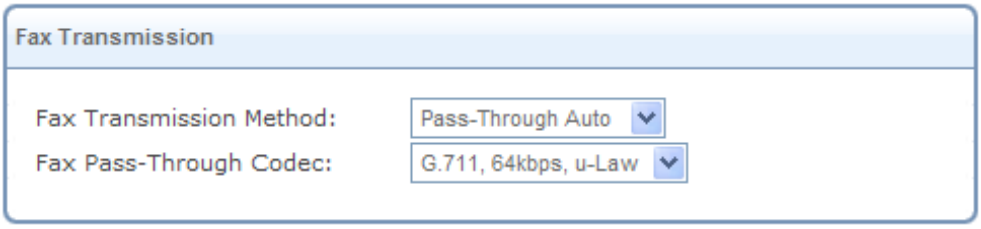

Figure 4.135 Line Settings – Fax Transmission

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Fax Transmission Method The method used to switch to a codec that supports transmission of fax messages. Select a method from the drop-down menu:

- **None** Selecting this option deactivates this feature. The codec agreed upon by both sides of the conversation (refer to Section 4.5.8.6) , which does not necessarily support fax transmission, will not change. Therefore fax trasmission may fail.
- **T.38 Auto** Fax tones will be converted into T.38 packets and then transmitted. This digital mode is the most reliable fax transmission method.
- **Pass-Through Auto** A conversation will begin with the codec agreed upon by both sides. If fax tones become present, OpenRG will switch to the codec selected in the next drop-down menu, which supports fax transmission.
- **Pass-Through Force** Select this option to ensure that OpenRG begins all conversations with the fax-supporting codec selected in the next drop-down menu.

Fax Pass-Through Codec This option is only visible if a Pass-Through method is selected. Select either the u-Law or A-Law codec supporting fax transmission.

4.5.5 Customizing Your Phone Service with a Numbering Plan

A numbering plan is a set of preconfigured shortcut numbers that when dialed, perform preset actions. The caller can dynamically activate or deactivate certain actions, using the telephone keypad. For example, the caller can activate call forwarding by dialing a prefix and the number to which to forward the call.

In the 'Line Settings' screen under the 'Voice' menu item, click the line's action icon . In the 'Numbering Plan' section, configure the following options.

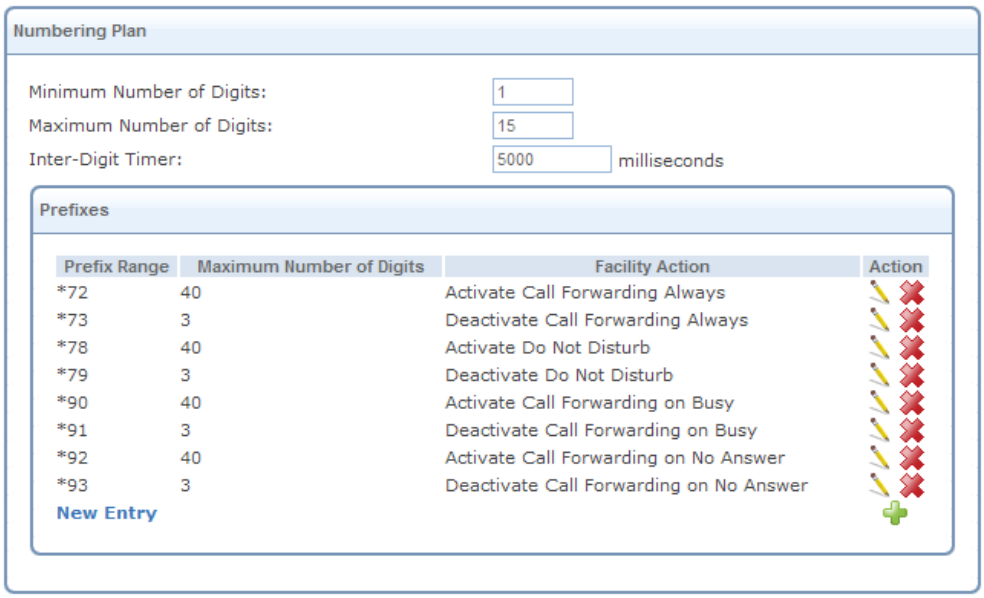

Figure 4.136 Line Settings – Numbering Plan

Minimum Number of Digits The minimum number of digits that must be dialed in order for OpenRG to send out the call.

Maximum Number of Digits The maximum number of digits that can be dialed in order for OpenRG to send out the call.

Inter-Digit Timer Specifies the duration (in milliseconds) of allowed inactivity between dialed digits. If the limit is exceeded, the dialing process times out and a warning tone is played. When you work with a proxy or gatekeeper, the number you have dialed before the dialing process has timed out is sent to the proxy/gatekeeper as the user ID to be called. This is useful for calling a remote party without creating a speed dial entry (assuming the remote party is registered with the proxy/gatekeeper).

The 'Prefixes' table displays the configured actions, containing the following parameters.

- **Prefix Range** The digits, or range of digits, constituting the prefix that activates the action. Note that a range is limited to ten digits, as only the last digit can be changed. For example, *72, 1800, 1800-1809, etc.
- **Maximum Number of Digits** The maximum number of digits that can be dialed when activating this action (including the prefix range).
- **Facility Action** The action that will be activated.

You can edit or delete the prefix entries defined in the table, using the action icons. To add a new entry, perform the following:

1. Click the 'New Entry' link. The 'Edit Prefix' screen appears.

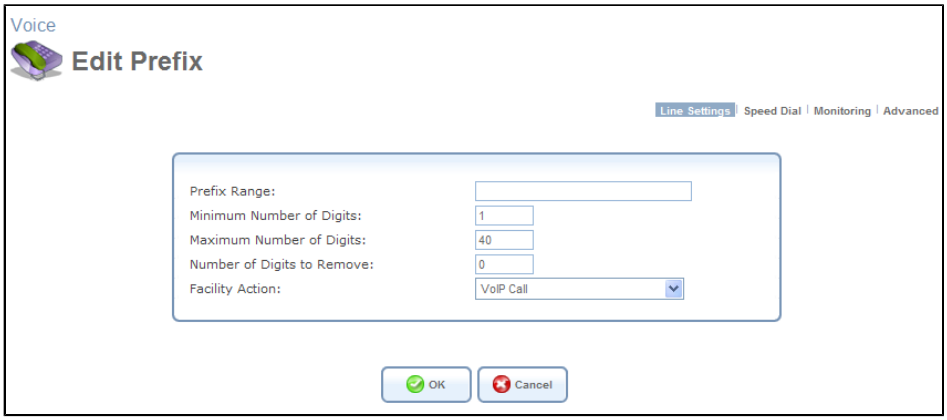

Figure 4.137 Edit Prefix

2. Enter a prefix range.
3. Determine the minimum and maximum number of digits to be dialed when activating a rule.
4. Enter the number of digits to remove from the dialed number. This is useful for removing unwanted dialed numbers, such as the digit 9 for external access.

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5. Select the facility action to perform. Among activating and deactivating the "Call Forwarding" and "Do Not Disturb" features described earlier, a new "VoIP Call" action is available. Use this action to override the generic numbering plan rules. For example, if you limit callers to dial 3-digit numbers only (by setting the generic maximum number of digits to 3), but would like to enable them to dial 1-800 numbers, enter "1800" as the prefix range, and specify the maximum number of digits that 1-800 numbers may have.

6. Click 'OK' to save the settings.

4.5.6 Using Distinctive Ring

If your gateway's Digital Signal Processing (DSP) module supports the Distinctive Ring service (available on some SIP servers), you can enrich your telephone line functionality by:

- Creating additional numbers for your line, and assigning a distinctive ring pattern to each of them. This is useful, for example, if you want to distinguish between incoming calls.
- Assigning a distinctive ring pattern to the incoming calls, by matching the caller ID to a specific ring tone. By doing so, you can recognize the caller's identity before answering the call.

Note: The availability of the service implementations depends on the SIP service provider.

To activate the Distinctive Ring service, you must first create a SIP account on a server that supports this feature. Examples of such SIP servers are Broadsoft (http://www.broadsoft.com) and Broadvoice (http://www.broadvoice.com). After registering and configuring your SIP account, enter the SIP account settings and the proxy parameters in OpenRG's 'Line Settings' screen, as described in the 'Connecting a Telephone' section of the OpenRG Quick Start Guide.

4.5.7 Ensuring Constant Connectivity with Failover

Normally, telephones connected to the FXS ports are provided with lines by a SIP service over the Internet. If your gateway also includes an *FXO* port, you can connect it to your telephone wall outlet (PSTN). In case your gateway's connection to the SIP service is disrupted, your phones can be automatically switched to the FXO port connected to the PSTN line, thereby ensuring that you always have telephone connectivity. This capability is called PSTN Failover.

Note: This feature is currently available only on the Broadcom 96358 platform.

You can both send and receive PSTN phone calls via FXO. When a call arrives from PSTN, all telephones connected to the FXS ports will ring simultaneously, unless the 'Do Not Disturb' feature is enabled on some of them. When using an FXS line on which call waiting is enabled, you will hear a call waiting tone whenever a call arrives from PSTN.

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Connect your gateway's FXO port to the telephone wall outlet. In the 'Line Settings' screen under the 'Voice' menu item, click the line's action icon . In the 'PSTN Failover' section of the external line settings screen, define under which circumstances the line failover will occur, by selecting the corresponding check boxes.

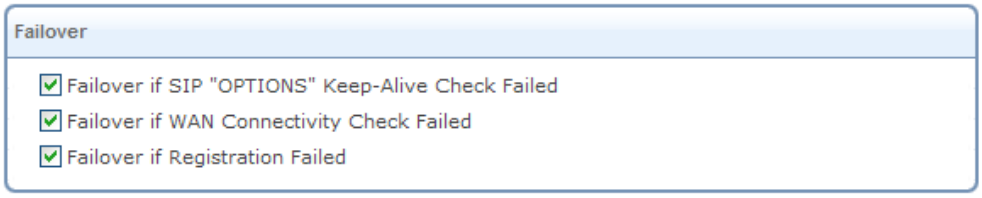
Failover
Failover if SIP "OPTIONS" Keep-Alive Check Failed
Failover if WAN Connectivity Check Failed
Failover if Registration Failed

Figure 4.138 Line Settings – PSTN Failover

Failover if SIP "OPTIONS" Keep-Alive Check Failed Select this check box to enable the line failover in case the SIP server stops responding to keep-alive messages sent by OpenRG's PBX.

Failover if WAN Connectivity Check Failed Select this check box to enable the line failover in case OpenRG has detected that there is no WAN connectivity.

Failover if Registration Failed Select this check box to enable the line failover in case the line's registration on the SIP server has failed.

4.5.8 Advanced Telephony Options

This section provides advanced options intended for a technician or a system administrator.

4.5.8.1 Determining DTMF Tones

DTMFs are the tones generated by your telephone's keypad, which are used by different telephone servers (for example, for selecting an option from a menu). If required, you can change the transmission method of these tones. In the 'Line Settings' screen under the 'Voice' menu item, click the line's action icon . In the 'Advanced SIP Settings' section, configure the following options.

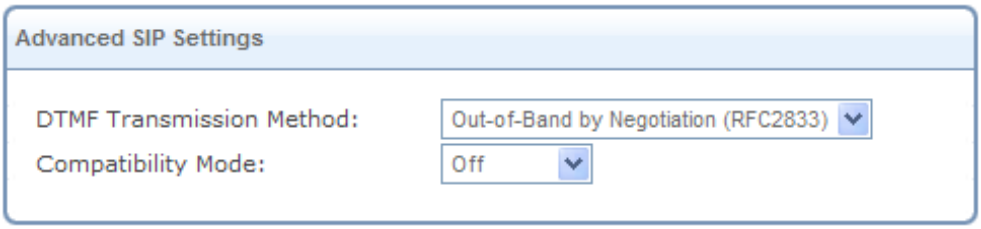

Figure 4.139 Line Settings – Advanced SIP Settings

DTMF Transmission Method Select a transmission method from the drop-down menu:

- **Inband** The DTMF keypad tones are sent within the voice stream.
- **Out-of-Band Always (RFC2833)** The DTMF keypad tones are represented by the keypad number and are sent as separate packets. This is a more reliable transmission method.

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- **Q.931 Keypad** The DTMF keypad tones are sent using Q.931 messages.
- **H.245 Alphanumeric** The DTMF keypad tones are sent using an H.245 alphanumeric Information Element (IE).
- **H.245 Signal** The DTMF keypad tones are sent using an H.245 signal IE.
- **Out-of-Band by Negotiation (RFC2833)** This method allows negotiation with the remote party. DTMF tones will be sent either in-band or out-of-band, depending on the remote party's preference.
- **SIP INFO** A special SIP message that includes the DTMF event description.

Compatibility Mode If you are using Broadsoft as your SIP provider, select its mode from this drop-down menu. Otherwise, leave as "Off".

4.5.8.2 Monitoring Your Lines

You can monitor the status of your telephone lines in one convenient place—the 'Monitoring' screen. Access this screen by clicking the 'Monitoring' link under the 'Voice' menu item.

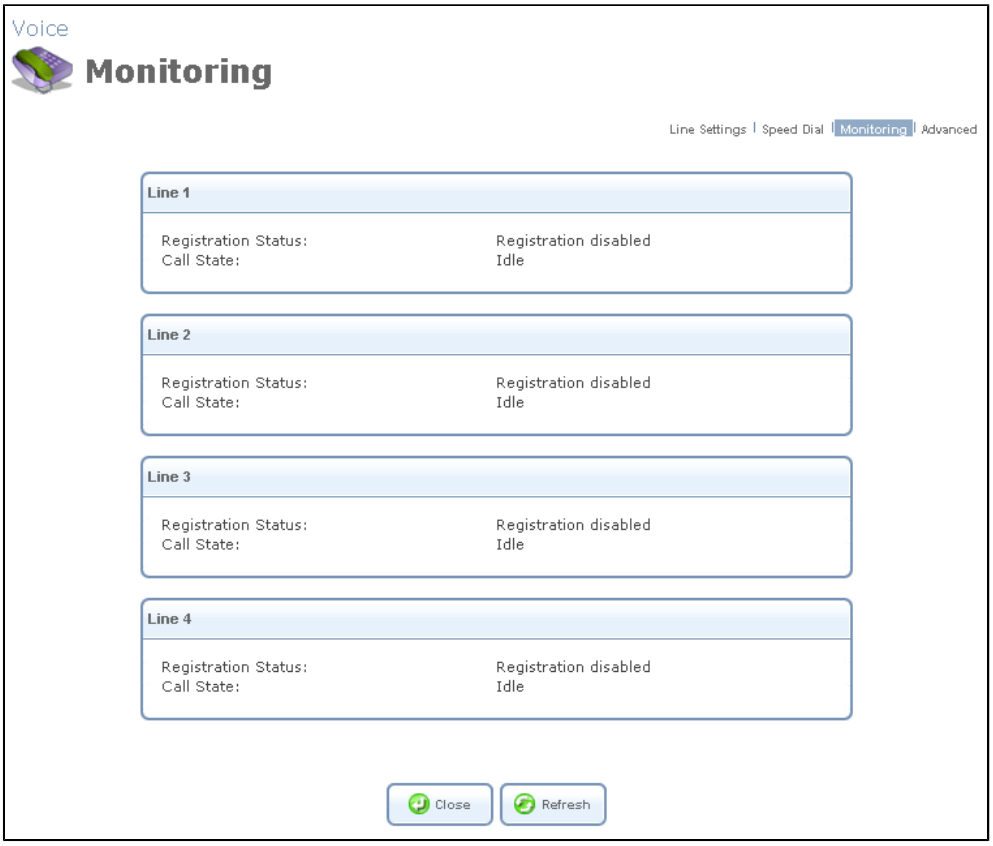

Figure 4.140 Monitoring

This screen displays all available lines and information on their statuses in real-time. These statuses include:

Registration Status Indicates whether the line is registered with a telephony service.

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Call State The current state of the line—either "Idle" or "In call".
When a call is in progress, additional call statistics appear, such as the number of packets sent/received/lost, interarrival jitter, and more.

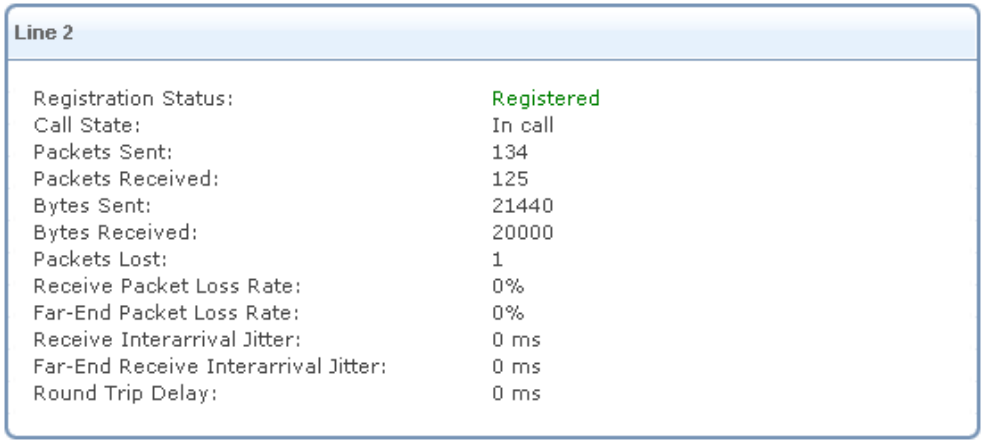

Figure 4.141 Call Statistics

4.5.8.3 Changing the Signaling Protocol

The signaling protocols available with OpenRG are Session Initiation Protocol (SIP), H.323, and Radvision's MGCP. To change your signaling protocol according to your telephone service provider, click the 'Advanced' link under the 'Voice' menu item. In the 'Signaling Protocol' section, select a protocol in the drop-down menu. A different subset of parameters will become visible with each signaling protocol choice. To apply the protocol change you must click 'Apply' (at the bottom of the 'Advanced' screen).

4.5.8.3.1 SIP

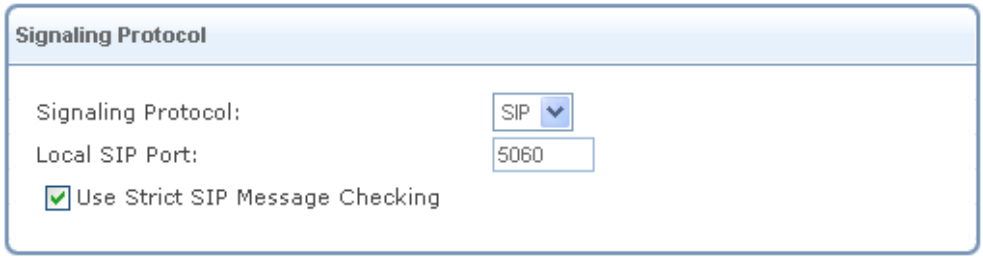

Figure 4.142 SIP Signaling Protocol

Local SIP Port The port on OpenRG that listens to SIP requests from the proxy. By default, port 5060 is used for SIP signaling of phones connected to the gateway. A common problem occurs when using a SIP agent on the LAN (for example, an IP phone). A SIP agent requires port forwarding configuration (refer to Section 4.2.3), which uses the same port—5060. This multiple use of the port causes failure of either or both services. Therefore, when configuring port forwarding for a SIP agent, you must change OpenRG's SIP port value (for example, to 5062). Note that the calling party must be made aware of this value when initiating a direct call (not using a proxy).

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Use Strict SIP Message Checking By default, OpenRG uses strict SIP message checking, which includes checking of tags in headers, international character conversions in URIs, and multiline formatted headers. There are cases in which this option should be disabled to ensure interoperability with certain service providers or third party user agents (SIP endpoints).

4.5.8.3.2 H.323

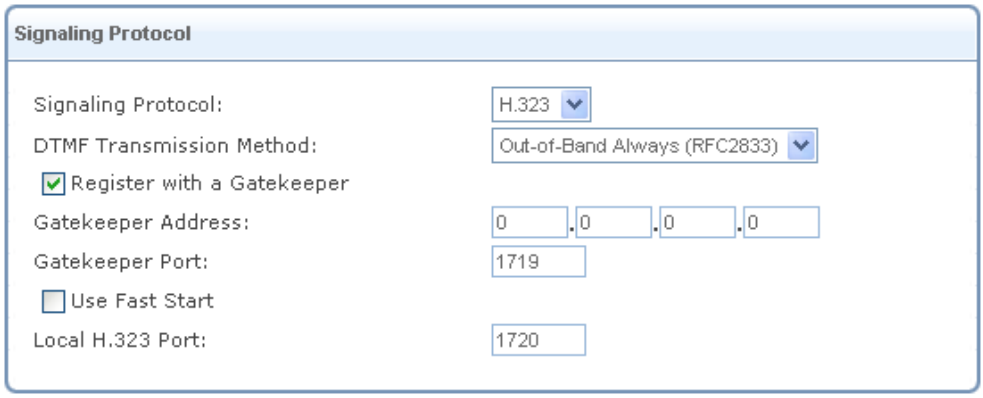

Figure 4.143 H.323 Signaling Protocol

DTMF Transmission Method Select a DTMF transmission method. For more information, refer to Section 4.5.8.1.

Register with a Gatekeeper Register the user with a gatekeeper, allowing other parties to call the user through the gatekeeper. When this item is checked, the following fields become visible:

Gatekeeper Address The IP address or name of the primary gatekeeper.

Gatekeeper Port The port on which the primary gatekeeper is listening for connections.

Specify Gatekeeper ID Select whether a gatekeeper ID should be used for the primary H.323 gatekeeper.

Gatekeeper ID The identifier for the primary H.323 gatekeeper.

Registration Time to Live Specify the valid duration of the H.323 gatekeeper registration in seconds.

Use Alternate Gatekeeper Select this check-box to configure an alternate gatekeeper for redundancy. When this item is checked, the following fields become visible:

Alternate Gatekeeper Address The IP address or name of the alternate gatekeeper.

Alternate Gatekeeper Port The port on which the alternate gatekeeper is listening for connections.

Use Fast Start The fast start connection method can result in quicker connection establishment, depending on the remote party's settings. Note that Microsoft NetMeeting does

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not support this option, so in order to interoperate with Microsoft NetMeeting, you should disable the feature.

Use H.245 Tunneling Indicates whether H.245 packets should be encapsulated within H.225 packets.

Local H.323 Port Specify the port number to use for H.323 signaling.

The Asterisk protocol has several limitations:

1. When a gatekeeper is configured, all calls are routed through it. This has the following effect on the speed-dials:
   - Destination type "Proxy" works normally – the call is sent to the gatekeeper.
   - Destination type "Local line" – the call will succeed, however it will not be a local call. It will be routed through the gatekeeper, and will go on normally since all of the local lines are registered with this gatekeeper.
   - Destination type "Direct Call" – speed dials of this type become disabled. This will be indicated in the speed dial table. For direct call speed dials, the "IP Address or Host Name" column will include, in addition to the address, the following red remark: "Disabled in H.323 gatekeeper mode".
2. When a gatekeeper is not configured, the only way to make a non-local call is to define a "direct call" speed dial, stating the destination's IP address (or host name). Speed dials of type "Proxy" are meaningless.

4.5.8.3.3 MGCP

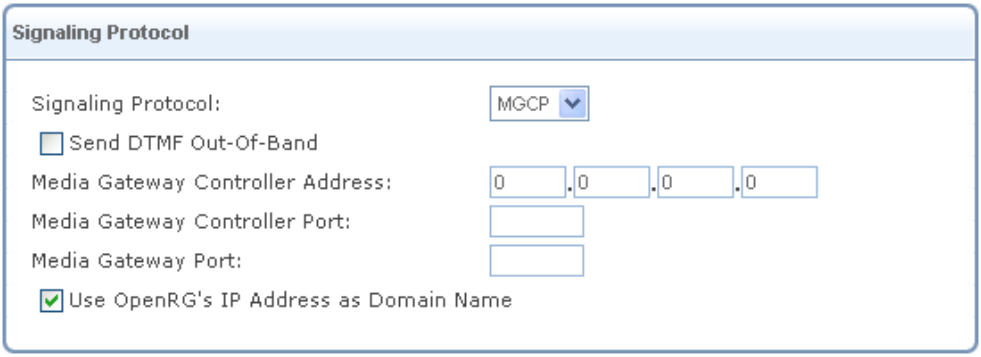

Figure 4.144 MGCP Signaling Protocol

Send DTMF Out-of-Band Select this option to use out-of-band DTMF transmission method (for more information, refer to Section 4.5.8.1).

Media Gateway Controller Address The IP address of the MGC (MGCP server), in dotted number notation.

Media Gateway Controller Port The port MGC uses to listen for connections.

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Media Gateway Port The port the gateway uses for MGCP connections.

Use OpenRG's IP Address as Domain Name OpenRG's IP address will be used as the domain name for identification. Unselect this check box when provided with a domain name from the MGCP service provider. The screen will refresh, adding the following field.

Media Gateway Domain Name Enter the domain name provided by the MGCP service provider.

4.5.8.4 Changing the Reserved RTP Port Range

The voice stream is transmitted in Real Time Protocol (RTP) packets, which require a range of open ports. If the default ports are required for another application, you can enter a different start port, thus creating a new range. To change the start port, configure the following option in the 'RTP' section.

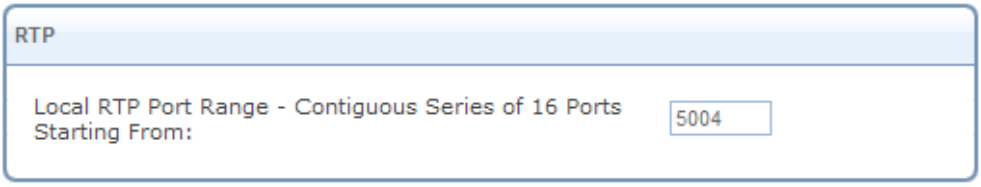

Figure 4.145 Advanced – RTP

Local RTP Port Range The range of ports reserved for Real Time Protocol (RTP) voice transport.

4.5.8.5 Configuring Quality of Service Parameters

Quality of Service (QoS) is aimed at improving the quality of voice traffic. To configure the QoS parameters, click the 'Advanced' link under the 'Voice' menu item. In the 'Quality of Service' section, configure the following options.

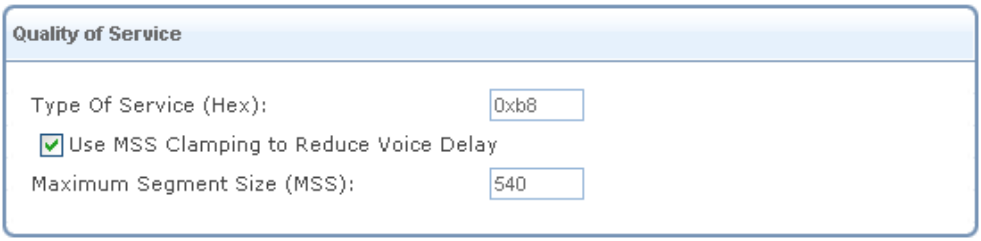

Figure 4.146 Advanced – Quality of Service

Type of Service (HEX) This is a part of the IP header that defines the type of routing service to be used to tag outgoing voice packets originated from OpenRG. It is used to tell routers along the way that this packet should get specific QoS. Leave this value as 0XB8 (default) if you are unfamiliar with the Differentiated Services IP protocol parameter.

Use MSS Clamping to Reduce Voice Delay When using Maximum Segment Size (MSS) Clamping, TCP streams routed via OpenRG when a voice call is active, will have a smaller segment size. This will cause RTP to receive better priority, and will help prevent high voice

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jitter that is caused by slow upstream transmission rate, which is common with most WAN connections (DSL, DOCSIS, etc.). When checking this option, the 'Maximum Segment Size (MSS)' field appears, where you can change the maximal segment size.

4.5.8.6 Selecting Audio Codecs

Audio codecs define the method of relaying voice data. Different codecs have different characteristics, such as data compression and voice quality. For example, G.723 is a codec that uses compression, so it is good for use where bandwidth is limited but its voice quality is not as good compared to other codecs such as the G.711.

To select the audio codecs, click the 'Advanced' link under the 'Voice' item menu. In the 'Codecs' section, configure the following options.

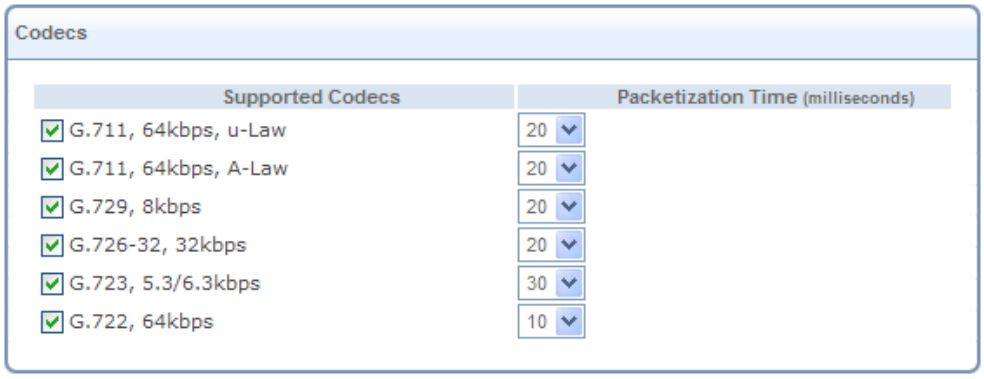

Figure 4.147 Advanced – Codecs

Supported Codecs In order to make a call, at lease one codec must be enabled. Moreover, all codecs may be enabled for best performance. When you start a call to a remote party, your available codecs are compared against the remote party's, to determine which codec will be used. The priority by which the codecs are compared is according to the descending order of their list, as depicted in the figure above. If there is no codec that both parties have made available, the call attempt will fail. Note that if more than one codec is common to both parties, you cannot force which of the common codecs that were found will be used by the remote party's client. If you do wish to force the use of a specific codec, leave only that codec checked.

Packetization Time The Packetization Time is the length of the digital voice segment that each packet holds. The default is 20 millisecond packets. Selecting 10 millisecond packets enhances the voice quality, as less information is lost due to packet loss, but doubles the load on the network traffic.

4.5.8.7 Improving Voice Reception with Echo Cancellation

Echo cancellation is the elimination of reflected signals (echoes) made noticeable by delay in the network. This also improves the bandwidth of the line. When the delay of a voice call exceeds acceptable limits, OpenRG will protect the far end from receiving any echo generated at the local end and sent back through the network.

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Note: This feature is currently available on the following platforms: Intel IXP425, Broadcom BCM96358, and on platforms with the VINETIC chipset.

To improve voice reception with echo cancellation, click the 'Advanced' link under the 'Voice' item menu. In the 'Echo Cancellation' section, configure the following options.

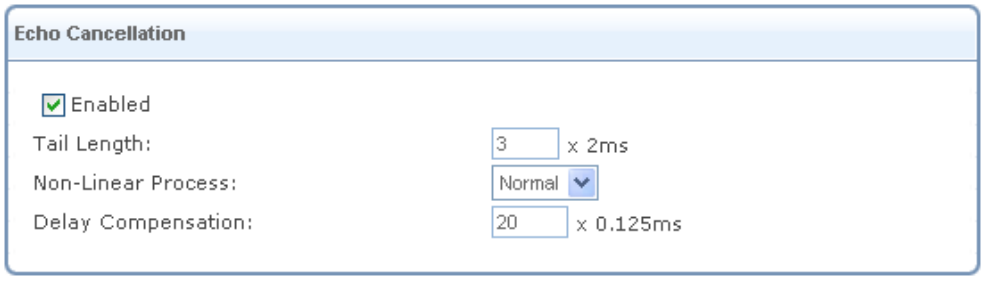

Figure 4.148 Advanced – Echo Cancellation

Enabled Select or deselect this check box to enable or disable this feature.

Tail Length Defines the length of the elapsed time frame used for calculating the extrapolation of the echo cancellation. A long tail improves the echo cancellation, but increases the load on the Digital Signal Processor (DSP).

Non-Linear Process (NLP) Determines the type of calculation that is used for removing the echo effect. You can set this feature to Normal, High or Off. Using high NLP improves the echo cancellation, but increases the load on the DSP.

Delay Compensation A time delay compensating the echo cancellation.

Note: On some platforms, the feature's graphic interface may differ from the one presented in the above figure.

4.5.8.8 Saving Bandwidth with Silence Suppression

Silence suppression enables optimization when no speech is detected. With this feature enabled, OpenRG is able to detect the absence of audio and conserve bandwidth by preventing the transmission of "silent packets" over the network.

To save bandwidth with silence suppression, click the 'Advanced' link under the 'Voice' item menu. In the 'Silence Suppression' section, configure the following options.

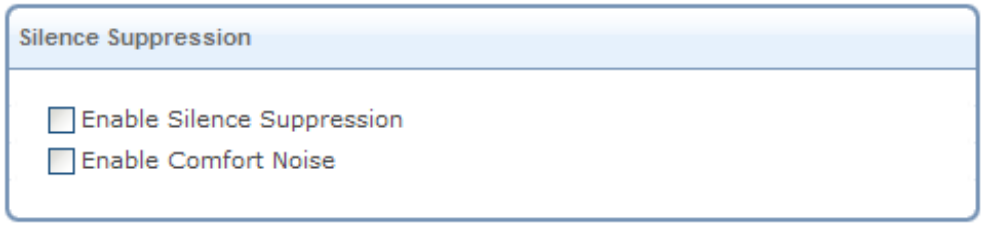

Figure 4.149 Advanced – Silence Suppression

Enable Silence Suppression Select this check box to enable this feature.

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Enable Comfort Noise Select this option to play a soft "comfort" noise if the other side is performing silence suppression, in order to signal your caller that the conversation is still active.

4.5.8.9 Avoiding Voice Distortion with Jitter Buffer

A Jitter Buffer is a shared data area where voice packets can be collected, stored, and sent to the voice processor in evenly spaced intervals. Variations in packet arrival time, called "jitter", can occur because of network congestion, timing drift, or route changes. The jitter buffer intentionally delays the arriving packets so that the end user experiences a clear connection with very little voice distortion.

To avoid voice distortion with jitter buffer, click the 'Advanced' link under the 'Voice' item menu. In the 'Jitter Buffer' section, configure the following options.

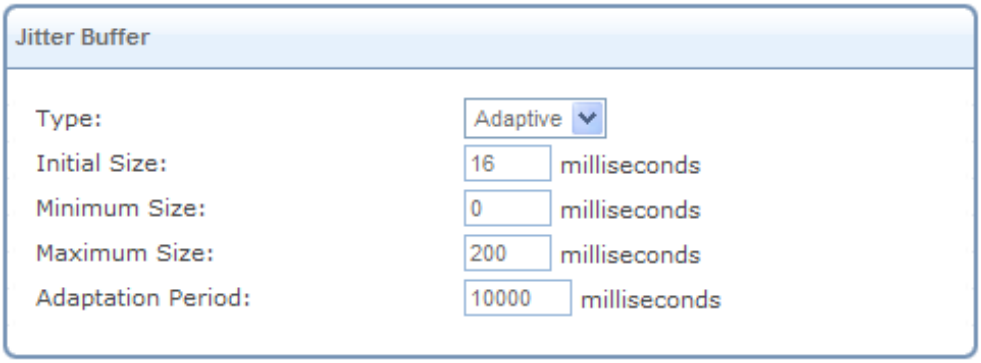

Figure 4.150 Advanced – Jitter Buffer

Type The type of the jitter buffer. Can be either adaptive or fixed. In case of adaptive jitter buffer, the following fields are visible:

Adapt According to Determines whether the jitter buffer size depends on the packet length or on the estimated network jitter.

Scaling Factor The size of the jitter buffer is Scaling Factor multiplied by packet length or by estimated network jitter (depending on the value of the previous field).

Local Adaptation The jitter buffer modifies its size during silence gaps. This way the change in delay is not noticed by the listener. This parameter determines when to perform this adaptation. The options are:

Off Regard as silence packets only those packets that the far end has marked as such.

On Regard as silence packets both the packets that the far end detected, and the packets that were locally detected as speech gaps.

On with sample interpolation No silence is needed. The adaptation is performed gradually through interpolation, so the listener does not notice the jitter buffer change in size. Notice that for this mode, modem or fax transmission could be distorted. This feature should only be used in the case of voice transmission.

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Initial Size The initial size of the jitter buffer (in milliseconds).

Maximum Size The maximum size of the jitter buffer (in milliseconds).

Minimum Size The minimum size of the jitter buffer (in milliseconds).

4.5.8.10 Changing the FXS Ports Settings

The 'FXS Ports' section in the 'Advanced' screen contains advanced electronic settings for the FXS (analog) ports, which should only be modified by an experienced administrator or technician.

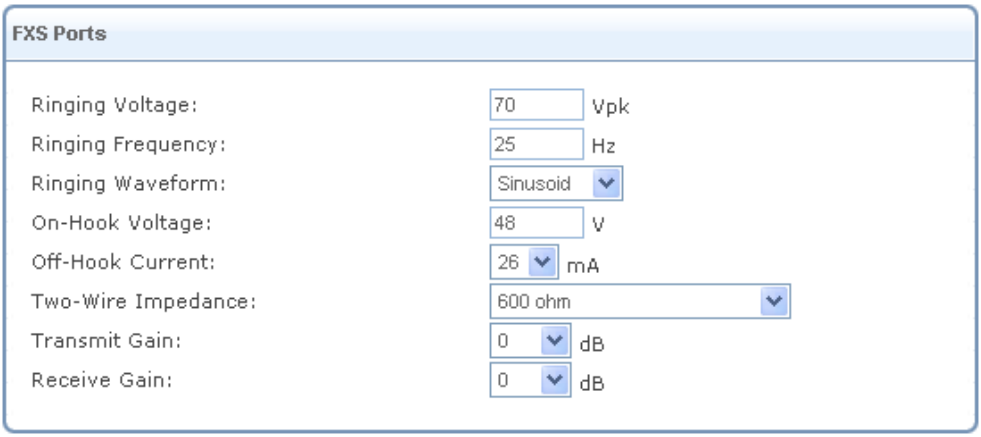

Figure 4.151 Advanced – FXS Ports

Ringing Voltage The ringing voltage in volts.

Ringing Frequency The ringing frequency in hertz.

Ringing Waveform The ringing waveform – sinusoid or trapezoid.

On-Hook Voltage The voltage of an idle handset in volts.

Off-Hook Current Limit The current of an active handset in milli-amperes.

Two-Wire Impedance Select the voice band impedance in ohms, synthesized by the SLIC.

Transmit Gain The transmit gain in decibels.

Receive Gain The receive gain in decibels.

4.5.8.11 Enable Voice

This section allows you to enable or disable OpenRG's Voice module.

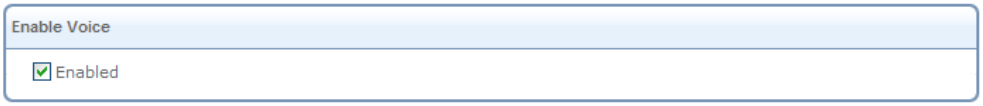

Figure 4.152 Enable Voice

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Note: This feature is only available on gateways with the Asterisk-based Voice module.

To disable the Voice module, deselect the 'Enable Voice' check box, and click 'Apply'. The following message appears in all of the service's configuration screens.

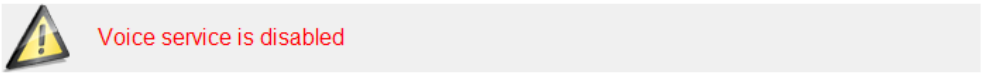

Figure 4.153 Disabled Voice Service

4.6 IP-PBX

OpenRG's Internet Protocol – Private Branch Exchange (IP-PBX) solution provides a private telephone switching system that allows telephone extensions to connect to each other as well as to the outside world.

In most cases, a PBX is an independent piece of equipment residing in an enterprise. Your gateway, however, includes such a PBX, saving you the need to purchase and install an independent PBX. Among the invaluable features of the PBX are its ability to switch calls between users in a network form, as well as share a specific number of external phone lines saving the added cost of designating an external phone line for each user.

OpenRG's PBX manages both Plain Old Telephone Service (POTS) and Voice over IP (VoIP) devices, utilizing VoIP lines to connect them to telephony service providers (proxies). Devices within OpenRG's PBX can freely communicate with each other, thus creating a cost-effective telephony environment.

OpenRG's PBX is available in two different versions—Home PBX and Full PBX. The Home PBX is a lighter version including only the necessities for running a basic PBX in your home, while the Full PBX features vast capabilities aimed at providing you with all aspects of a telephony exchange system. While this section covers the Full PBX, notes are incorporated for features that are not available with the Home PBX version.

Click the 'IP-PBX' menu item under the 'Services' tab. The main IP-PBX screen appears, displaying the available lines and their status.

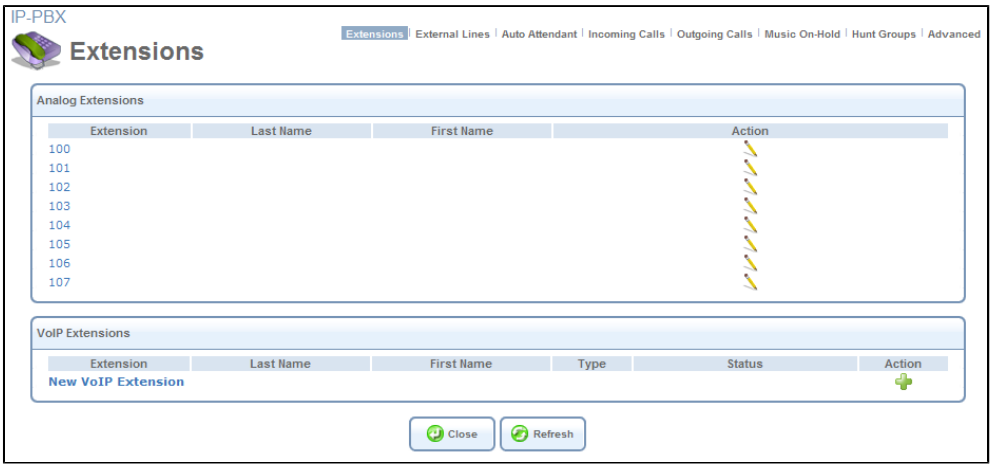

Figure 4.154 IP-PBX Lines

4.6.1 Configuring Your Analog Extensions

To view and edit an analog port's default extension, as well as other settings, click the extension number (or its action icon). The 'Edit Extension' screen appears.

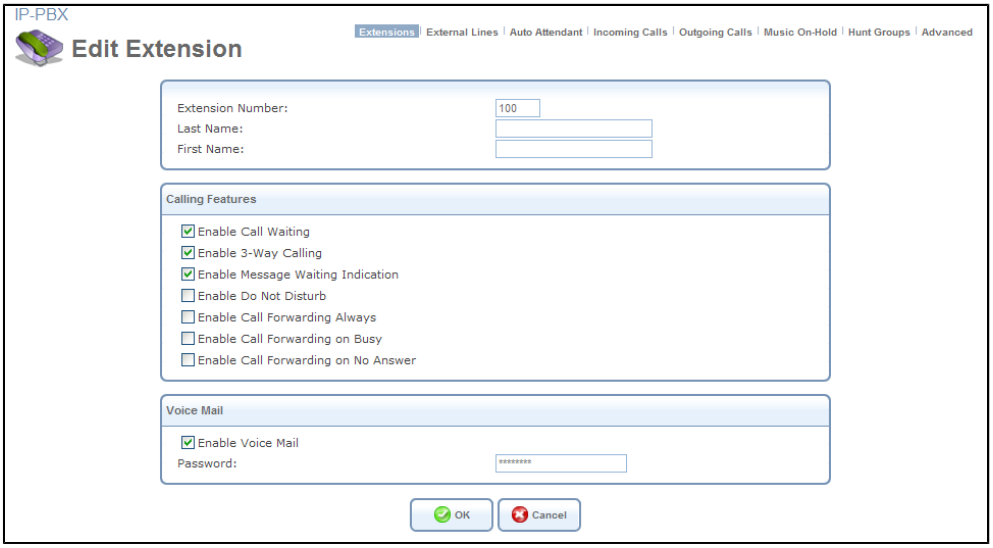

Figure 4.155 Edit Extension

Configure the following parameters:

Extension Number Specify the extension number.

Last Name, First Name Specify a full name for the extension's user.

Enable Call Waiting Select this check box to enable the Call Waiting feature.

Enable 3-Way Calling Select this check box to allow all forms of three-way conversations. When this option is disabled you will not be able to place a call on hold, transfer a call or engage in a call conference.

Enable Message Waiting Indication Select this check box to play a special stutter tone whenever you receive a voice message.

Enable Do Not Disturb Select this check box to prevent calls from reaching your extension. The caller will be forwarded to your voice mail. This feature can also be enabled or disabled by dialing *78 or *79 respectively.

Enable Call Forwarding Always Select this check box to forward incoming calls to another telephone number. The screen refreshes, displaying a field for entering the alternate number.

Figure 4.156 Enable Call Forwarding Always

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This feature can also be enabled or disabled by dialing *72 (and the alternate number) or *73 respectively.

Enable Call Forwarding on Busy Select this check box to forward incoming calls to another telephone number when the line is busy. The screen refreshes, displaying a field for entering the alternate number.

Figure 4.157 Enable Call Forwarding on Busy

This feature can also be enabled or disabled by dialing *90 (and the alternate number) or *91 respectively.

Enable Call Forwarding on No Answer Select this check box to forward incoming calls to another telephone number if the call is not answered within a specific timeframe. The screen refreshes, displaying a field for entering the alternate number, and a field for determining the timeframe to ring before the call is forwarded.

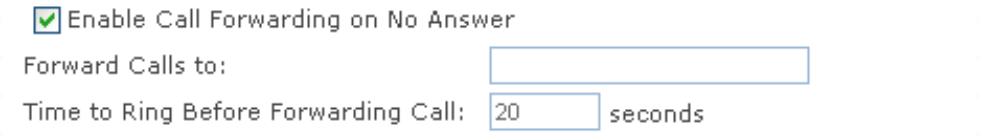

Figure 4.158 Enable Call Forwarding on No Answer

This feature can also be enabled or disabled by dialing *92 (and the alternate number) or *93 respectively.

Enable Voice Mail Enable the voice mail feature. To learn how to use this feature, refer to Section 4.6.9.

Figure 4.159 Line Parameters – Disconnect Supervision

Note: This feature is only available on Intel IXP425 platforms.

Disconnect Supervision When the 'Forward Disconnect Enabled' check box is selected, the FXS sends a momentary lapse of power to the telephone device whenever the remote party hangs up.

4.6.2 Operating Your Telephone

Following are several guidelines that will help you perform basic telephne operations.

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- **Placing a Call**

  1. Pick up the handset on the phone.
  2. Dial the remote party's number (for an external call, begin with **9** and dial '#' to have the call sent out immedately).

- **Answering a Waiting Call**
  When the Call Waiting feature is enabled, you may receive a call while engaged in another call. When such call arrives, you will hear a call waiting tone.

  1. To answer a waiting call, press 'Flash'.
  2. 'Flash' may be used to switch back and forth between calls.

- **Blind Transfer**
  To transfer an existing call (B) to a third party (C) without consultation, perform the following:

  1. Press 'Flash'. Party B will now be placed on hold, and you will hear a dial tone.
  2. Dial party C's number (for an external call, begin with **9** and dial '#' to have the call sent out immedately).
  3. To complete the transfer, place the phone's handset on-hook. B is now initiating a call to C.

- **Call Transfer With Consultation**
  To transfer an existing call (B) to a third party (C), perform the following:

  1. Press 'Flash' on the phone. Party B will now be placed on hold, and you will hear a dial tone.
  2. Dial party C's number (for an external call, begin with **9** and dial '#' to have the call sent out immedately). You can engage in conversation.
  3. To complete the transfer, place the phone's handset on-hook.

- **3-Way Conference**
  To extend an existing call (B) into a 3-way conference by bringing in an additional party (C), perform the following:

  1. Press 'Flash' on the phone. Party B will now be placed on hold and you will hear a dial tone.
  2. Dial party C's number (for an external call, begin with **9** and dial '#' to have the call sent out immedately). You can engage in conversation.
  3. Press 'Flash' to join both C and B to a single conference.

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4. When you place the phone's handset on-hook, party B and party C will remain in conversation.

4.6.3 Connecting VoIP Telephones

Connect a VoIP telephone to an available LAN socket on your gateway. Once connected, you will have to configure the telephone and then add a VoIP extension for it in OpenRG. When done, the status of the extension should change to "Registered".

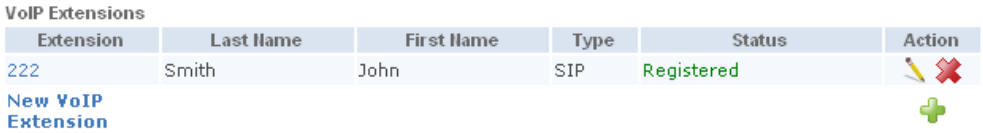

Figure 4.160 VoIP Extensions

OpenRG supports both SIP and MGCP VoIP devices. You must be aware of your type of device and configure it accordingly.

4.6.3.1 Configuring Your VoIP Telephone

Configure the telephone with the following settings. Refer to the device's documentation if necessary.

- **SIP Device** – Configure the SIP service provider with OpenRG's IP address (192.168.1.1), and the device's SIP user ID with an extension number of your choice.
- **MGCP Device** – Configure the device's media gateway controller field with OpenRG's IP address (192.168.1.1). In addition, if the device's user ID is configurable, verify that it is set to "aaln/1". Note that if the device has multiple lines, their user ID should be "aaln/1","aaln/2", and so forth.

4.6.3.2 Adding a VoIP Extension

To add a VoIP extension for the IP telephone, click the 'New VoIP Extension' link in the 'Extensions' screen (see Figure 4.154). The 'Edit Extension' screen appears.

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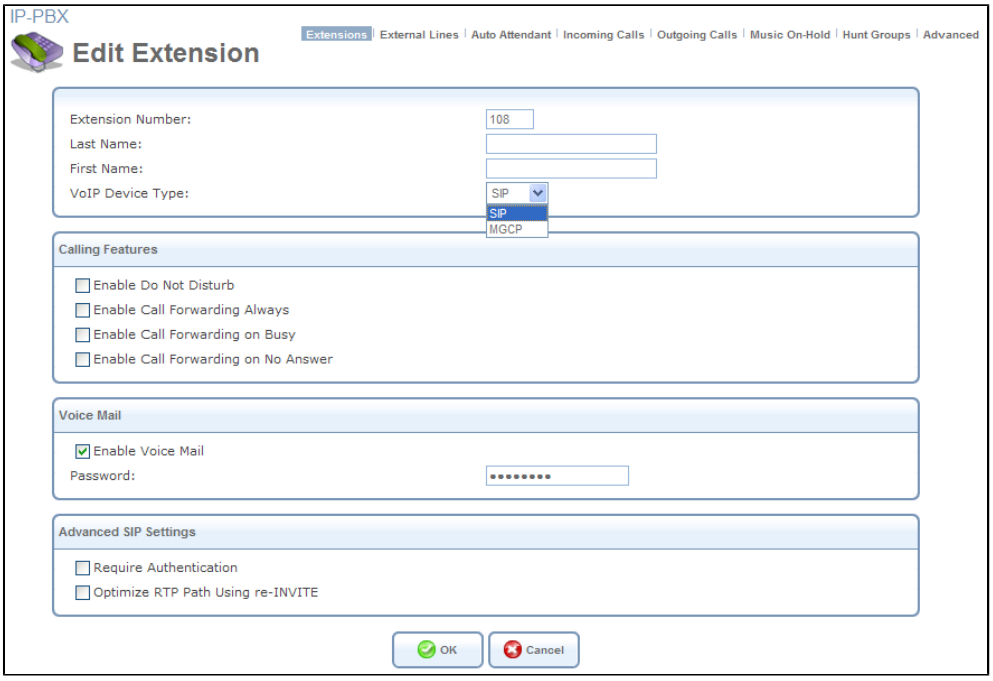

Figure 4.161 Edit Extension – SIP

Configure the following parameters, common to both device types (SIP/MGCP):

Extension Number Specify the extension number, as pre-configured in the device's settings.

Last Name, First Name Specify a full name for the extension's user.

VoIP Device Type Select your device type, SIP or MGCP. The screen refreshes accordingly, and the different parameters are described later in this section.

Enable Do Not Disturb Select this check box to prevent calls from reaching your extension. The caller will be forwarded to your voice mail. This feature can also be enabled or disabled by dialing *78 or *79 respectively.

Enable Call Forwarding Always Select this check box to forward incoming calls to another telephone number. The screen refreshes, displaying a field for entering the alternate number.

Figure 4.162 Enable Call Forwarding Always

This feature can also be enabled or disabled by dialing *72 (and the alternate number) or *73 respectively.

Enable Call Forwarding on Busy Select this check box to forward incoming calls to another telephone number when the line is busy. The screen refreshes, displaying a field for entering the alternate number.

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Figure 4.163 Enable Call Forwarding on Busy

This feature can also be enabled or disabled by dialing *90 (and the alternate number) or *91 respectively.

Enable Call Forwarding on No Answer Select this check box to forward incoming calls to another telephone number if the call is not answered within a specific timeframe. The screen refreshes, displaying a field for entering the alternate number, and a field for determining the timeframe to ring before the call is forwarded.

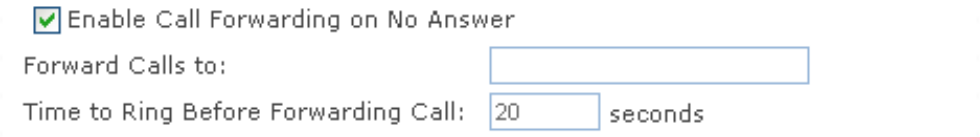

Figure 4.164 Enable Call Forwarding on No Answer

This feature can also be enabled or disabled by dialing *92 (and the alternate number) or *93 respectively.

Enable Voice Mail Enable the voice mail feature. To learn how to use this feature, refer to Section 4.6.9.

4.6.3.2.1 SIP Device Parameters

By default, the 'VoIP Device Type' drop-down menu option is set to SIP. In addition to the general parameters described above, configure the following SIP-specific parameters in the 'Advanced SIP Settings' section.

Require Authentication Select this check box to secure your telephony network. By default, SIP devices register with OpenRG as their proxy (you must configure the device's proxy field with OpenRG's IP address), by identifying themselves with extension numbers, pre-configured on both the devices and on OpenRG. When selecting the 'Require Authentication' option, OpenRG will not accept mere extension number identification, but will require additional authentication data, in the form of a user name and password. This protects your telephony network from, for example, a malicious wireless intruder disguising himself as one of your office extensions, and making free phone calls at your expense. When this option is selected, the screen refreshes, providing username and password fields.

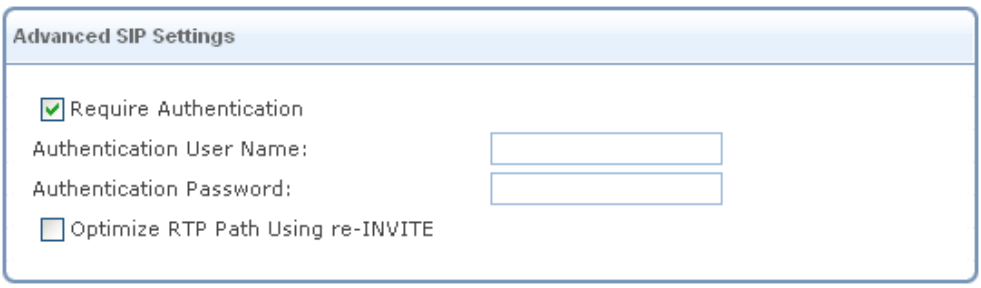

Figure 4.165 SIP Settings

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- **Authentication User Name** The user name used for SIP device authentication. Note that this user name must first be configured on the SIP device.
- **Authentication Password** The password used for SIP device authentication. Note that this password must first be configured on the SIP device.

Optimize RTP Path Using re-INVITE Select this option if you would like OpenRG to attempt letting the telephony LAN device and the SIP proxy exchange Real Time Protocol (RTP) traffic (the audio stream) directly, which is more efficient. Note that in order for this feature to work, it must also be enabled for the VoIP line through which the call is routed (refer to Optimize RTP Path Using re-INVITE).

OpenRG also supports features such as Call Waiting, 3-way Calling, and Message Waiting Indication. However, on a SIP device these features are controlled from the telephone, and therefore non-configurable on OpenRG.

4.6.3.2.2 MGCP Device Parameters

Selecting the MGCP option in the 'VoIP Device Type' drop-down menu refreshes the screen.

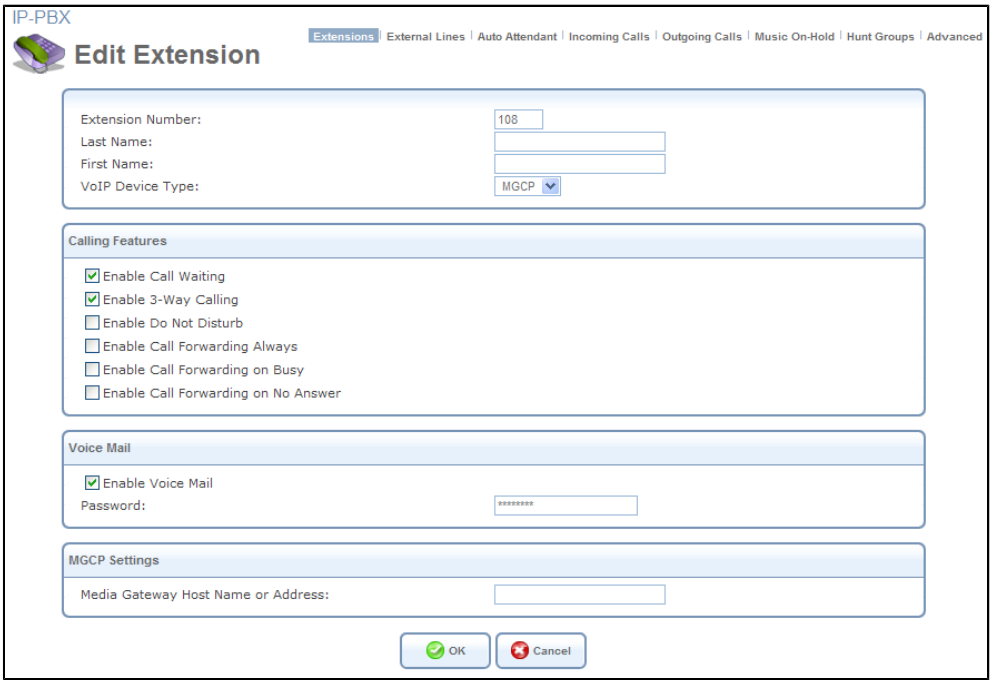

Figure 4.166 Edit Extension – MGCP

In addition to the general parameters described above, configure the following MGCP-specific parameters.

Enable Call Waiting Select this check box to enable the Call Waiting feature.

Enable 3-Way Calling Select this check box to allow all forms of three-way conversations. When this option is disabled you will not be able to place a call on hold, transfer a call or engage in a call conference.

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Media Gateway Host Name or Address Specify the telephony device's name or IP address. If the device is connected to OpenRG's LAN, it is recommended to override its dynamic IP address assignment, by pre-configuring it with a static IP address outside OpenRG's range of dynamically-assigned IP addresses. This will avoid its address from changing (in which case you would have to re-enter the new address in this field.)

4.6.4 Opening Telephony Service Accounts

To connect your PBX to the outside world, it is necessary that you obtain a telephony service account, for example a SIP account, as explained in the 'Connecting a Telephone' section of the OpenRG User Manual. This example simulates two separate SIP accounts—one for office use and one for home use. Therefore, open an additional SIP account, either with "FWD" or with another provider of your choice.

In addition to SIP, OpenRG supports the H.323 protocol, which you can obtain as your type of telephony service.

4.6.5 Defining VoIP Lines

After creating telephony accounts and obtaining the necessary details, configure respective VoIP lines, as follows:

1. Click the 'External Lines' link in the PBX main screen (see Figure 4.154). The 'External Lines' screen appears.

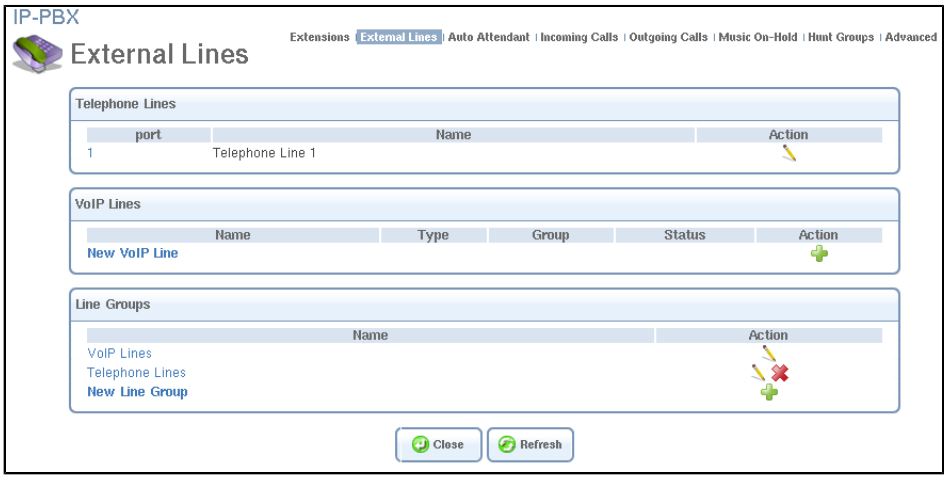

Figure 4.167 External Lines

2. Click the 'New VoIP Line' link. The 'Edit Line' screen appears.

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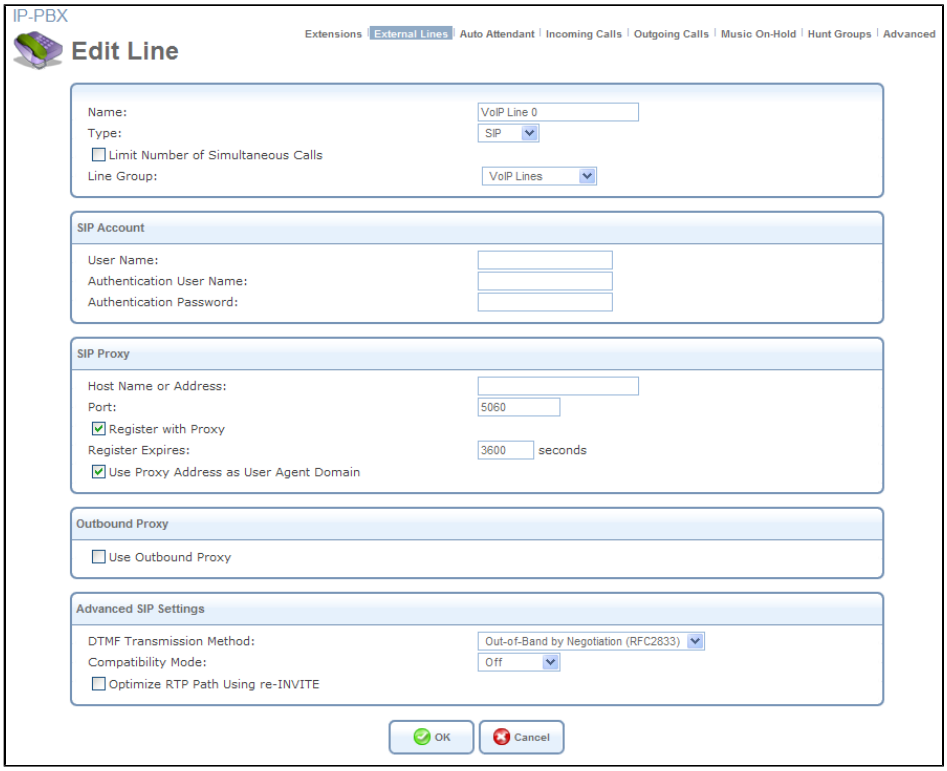

Figure 4.168 Edit Line

3. Configure the following parameters, common to both account types (SIP/H.323). Then, configure the account-specific parameters, as described in the following respective sections.

Name The name of the VoIP line. For example, type "Office" as the name for this VoIP line, as it will simulate your office line.

Type Select the type of VoIP line according to your type of telephony service subscription —SIP or H.323. Their different settings are depicted in the following sections.

Limit Number of Simultaneous Calls You can control the maximum number of simultaneous calls performed from OpenRG through the VoIP line. This is useful, for example, if your telephony account has a call limit. When selecting this option, the screen refreshes, providing a field for entering the maximum number.

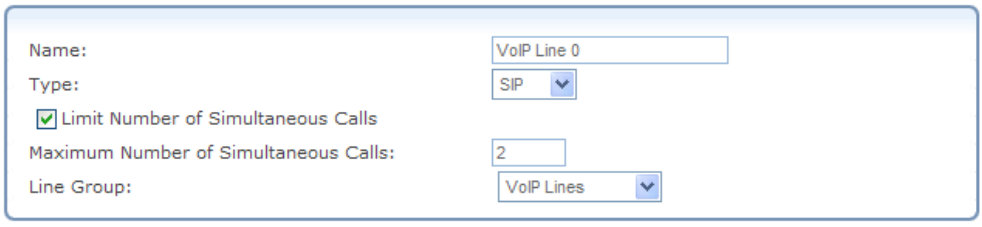

Figure 4.169 Limit Number of Simultaneous Calls

Line Group A group of VoIP lines to which this line belongs. When multiple line groups are defined, use the drop-down menu to select a group to which this VoIP line will belong. To define line groups, refer to Section 4.6.5.3.

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4.6.5.1 SIP Account

By default, the 'Type' drop-down menu option is set to SIP. In addition to the general parameters described above, configure the following SIP-specific parameters.

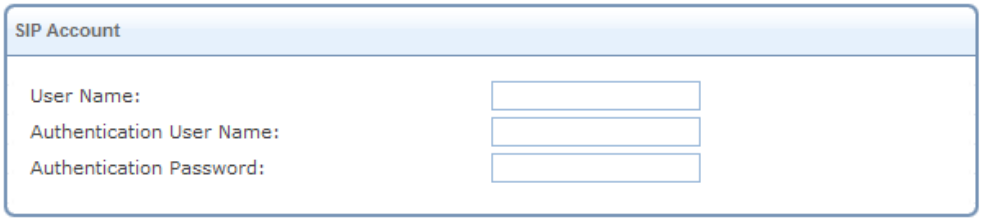

Figure 4.170 Edit Line – SIP Account

User Name Enter your SIP account ID.

Authentication User Name/Password The login name and password used for authentication with the proxy.

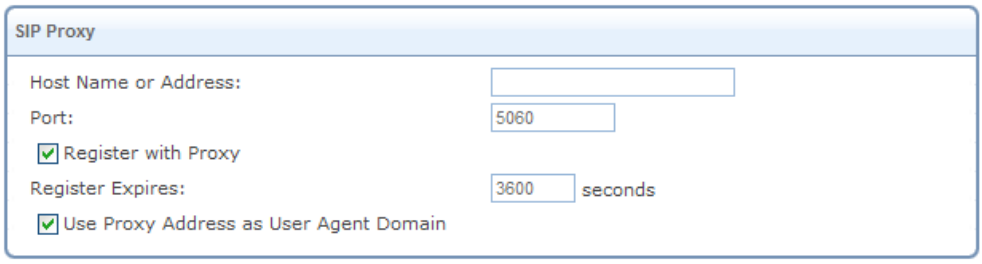

Figure 4.171 Edit Line – SIP Proxy

Host Name or Address Enter the IP address or host name that you received when registering your SIP account. Your free account's host name should be "fwd.pulver.com" (this may vary; you should check your registration e-mail).

Port The port that this proxy is listening on.

Register with Proxy Select this option to register with the proxy, allowing other parties to call OpenRG through it. When this item is checked, the following field becomes visible:

Register Expires The number of seconds between registration renewals.

Use Proxy Address as User Agent Domain Select this option to use the set proxy or its IP address as a domain name specified in outgoing SIP messages. When this option is unchecked, the 'User Agent Domain' field appears. Use this field for setting another proxy address as a user agent domain.

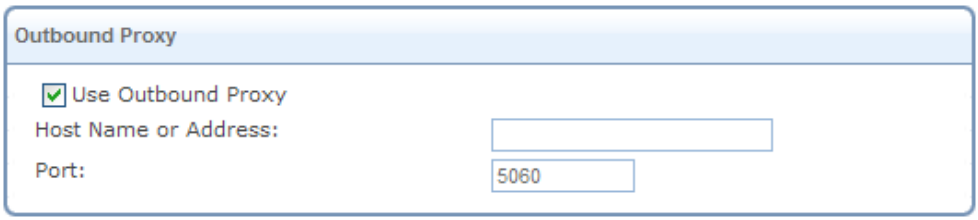

Figure 4.172 Edit Line – Outbound Proxy

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Use Outbound Proxy Some network service providers require the use of an outbound proxy. This is an additional proxy, through which all outgoing calls are directed. In some cases, the outbound proxy is placed alongside the firewall and is the only way to let SIP traffic pass from the internal network to the Internet. The free world-wide dialing service is an example of a service provider that requires the use of an outbound proxy. When this option is checked, the following fields become visible.

Host Name or Address Enter the outbound proxy's IP address or host name that you received when registering your SIP account in the 'Host Name or Address' field. Your free account's outbound proxy's name should be "fwdnat.pulver.com" (this may vary; you should check your registration e-mail).

Port The port on which the outbound proxy is listening. Set this field to 5082 (this may also vary).

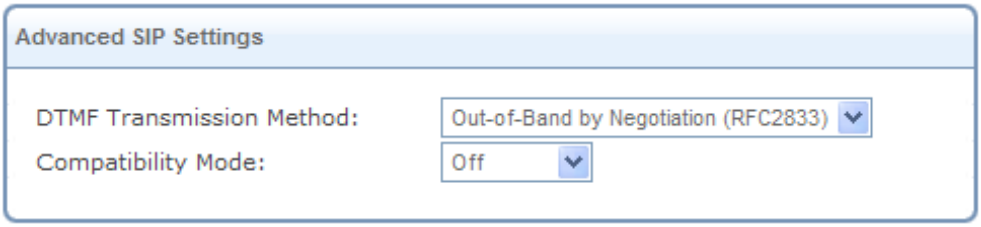

Figure 4.173 Edit Line – Advanced SIP Settings

DTMF Transmission Method Select a transmission method from the drop-down menu:

- **Inband** The DTMF keypad tones are sent within the voice stream.
- **Out-of-Band Always (RFC2833)** The DTMF keypad tones are represented by the keypad number and are sent as separate packets. This is a more reliable transmission method.
- **Q.931 Keypad** The DTMF keypad tones are sent using Q.931 messages.
- **H.245 Alphanumeric** The DTMF keypad tones are sent using an H.245 alphanumeric Information Element (IE).
- **H.245 Signal** The DTMF keypad tones are sent using an H.245 signal IE.
- **Out-of-Band by Negotiation (RFC2833)** This method allows negotiation with the remote party. DTMF tones will be sent either in-band or out-of-band, depending on the remote party's preference.
- **SIP INFO** A special SIP message that includes the DTMF event description.

Compatibility Mode If you are using Broadsoft as your SIP provider, select its mode from this drop-down menu. Otherwise, leave as "Off".

Optimize RTP Path Using re-INVITE Select this option if you would like OpenRG to let the SIP proxy and a telephony LAN device exchange Real Time Protocol (RTP) traffic (the audio stream) directly, which is more efficient.

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Verify that the status of the new VoIP line changes to "Registered". Your SIP-based "Office" line is now ready to be used. In the same manner as described above, define another VoIP line named "Home", which will simulate your home line. You may define VoIP lines for as many SIP proxy accounts as you have, designating each account for a different purpose.

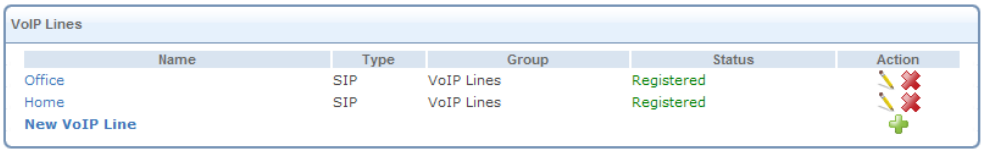

Figure 4.174 VoIP Lines

Note: The 'Telephone Lines' section is currently available on the Broadcom BCM96358 platform only. This section displays an analog (PSTN) line connected via the gateway's Foreign Exchange Office (FXO) port. You can both make and receive phone calls through this line. This is especially useful in case of Internet connectivity problem, when VoIP lines are unavailable.

4.6.5.2 H.323 Account

If you have obtained an H.323 telephony account, select the "H.323" option in the 'Type' drop-down menu of the 'Edit Line' screen (see Figure 4.168). The screen refreshes.

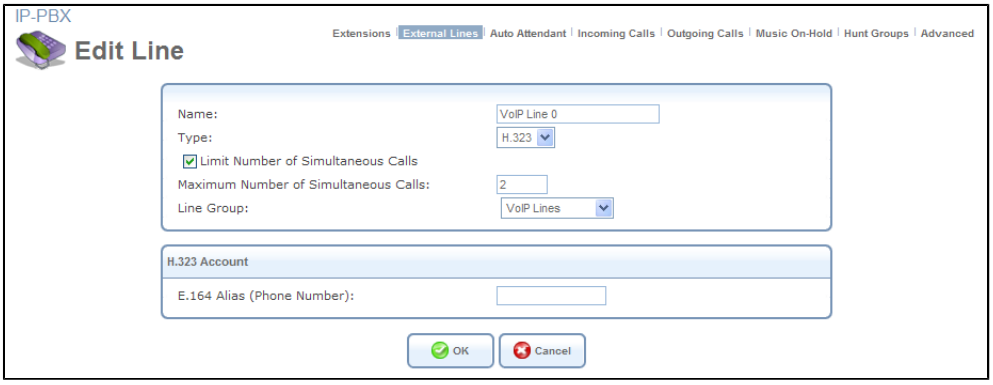

Figure 4.175 Edit Line – H.323

In addition to the general parameters you have already configured above, configure the following H.323-specific parameter.

E.164 Alias (Phone Number) Enter your H.323 account phone number.

4.6.5.3 Grouping Your VoIP Lines

By default, the PBX is pre-configured with one editable, non-removable VoIP line group, to which all created lines will automatically be added. If you would like to distribute your VoIP lines between several groups, simply define additional ones. Click the 'New Line Group'. The 'Edit Line Group' screen appears.

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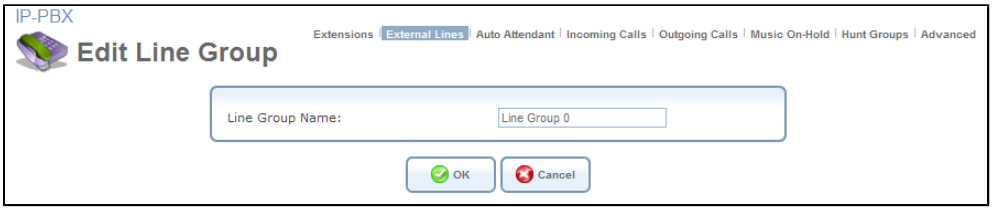
IP-PBX
Edit Line Group
Extensions | External Lines | Auto Attendant | Incoming Calls | Outgoing Calls | Music On-Hold | Hunt Groups | Advanced
Line Group Name:
Line Group 0
OK
Cancel

Figure 4.176 Edit Line Group

Enter a name for the new group, and click 'OK' to save your settings. New and existing VoIP lines can now be assigned to each line group, by selecting the group in the 'Line Group' drop-down menu of the 'Edit Line' screen (see Figure 4.168).

4.6.6 Creating Auto Attendants

Note: This feature is only available with the Full PBX version.

OpenRG's PBX includes an auto attendant feature, allowing you to intelligently handle incoming calls, by providing callers the ability to route their calls to relevant parties using the telephone's keypad. You can customize a menu of multiple auto attendants according to your office structure or any other preference. By default, the PBX is pre-configured with one editable, non-removable auto attendant named 'Main Auto Attendant'.

This section depicts an example where the default 'Main' auto attendant is used for an office. Optional auto attendants describe the office location, and inform of the office working hours (an off-hours message). You will first create the optional auto attendants, and then edit the 'Main' attendant with reference to an optional attendant.

1. Create an "Office Directions" auto attendant:

   a. Click the 'Auto Attendant' link in the PBX main screen (see Figure 4.154). The following screen appears.

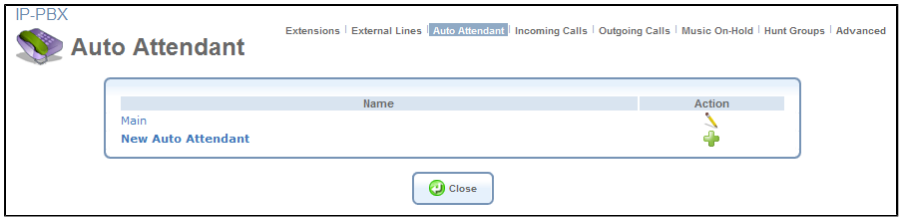

Figure 4.177 Auto Attendant

   b. Click the 'New Auto Attendant' link. The 'Edit Auto Attendant' screen appears.

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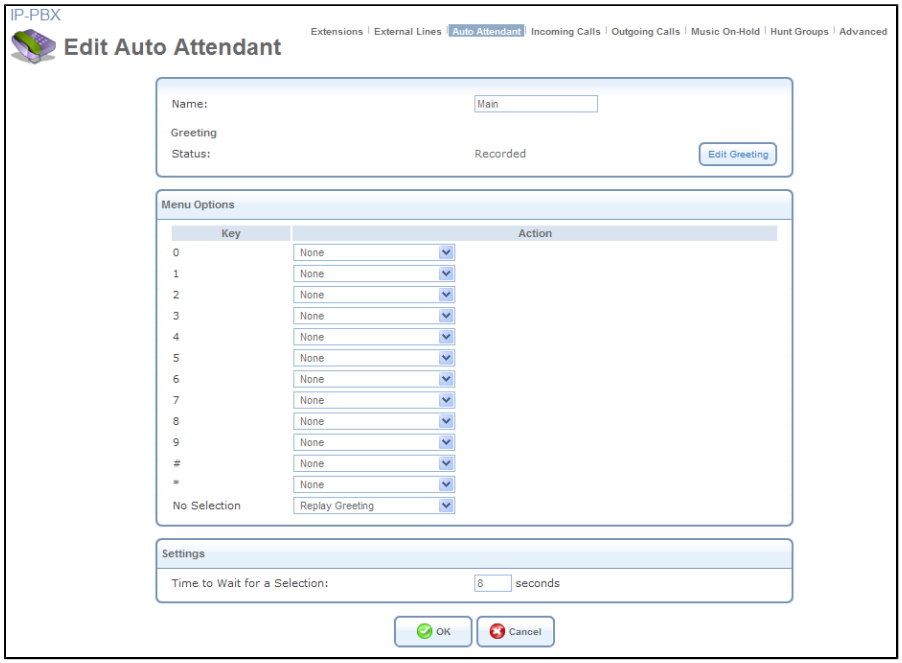

Figure 4.178 Edit Auto Attendant

c. Configure the following parameters:

Name The name of the auto attendant. Type "Office Directions" as the name for this auto attendant.

Greeting The greeting callers will hear when dialing to OpenRG. In order to use OpenRG's default greeting or record your own, you must first connect an external storage device to your gateway. To record your preferred message, click the 'Edit Greeting' button. The 'Auto Attendant Greeting' screen appears.

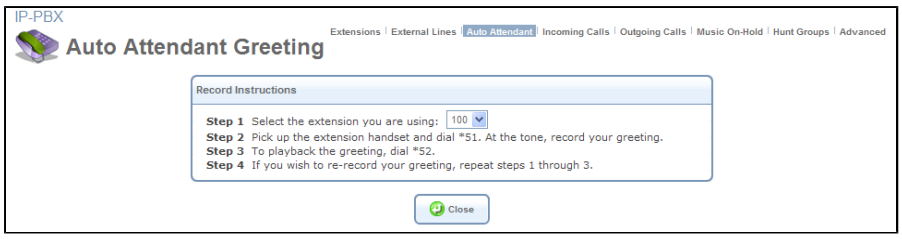
IP-PBX
Auto Attendant Greeting
Extensions | External Lines | Auto Attendant | Incoming Calls | Outgoing Calls | Music On-Hold | Hunt Groups | Advanced
Record Instructions
Step 1 Select the extension you are using: 100
Step 2 Pick up the extension handset and dial *51. At the tone, record your greeting.
Step 3 To playback the greeting, dial *52.
Step 4 If you wish to re-record your greeting, repeat steps 1 through 3.
Close

Figure 4.179 Auto Attendant Greeting

Follow the instructions in this screen to record the message directing to your office location. Note that in **Step 1** you must select the extension through which you are recording the message. **Important:** When done, press the 'Close' button.

Menu Options Use this section to configure an action for each keypad button press. This includes the pound and star keys, as well as an action for when no button is pressed. Note that at any time, the caller can dial and be routed to any extension number. The actions that can be defined for every keypad button are:

- **None** No action will be performed.

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- **Transfer to Extension** Transfer the call to a specific extension. When defining this action, the screen refreshes, displaying a drop-down menu with all currently available extensions.

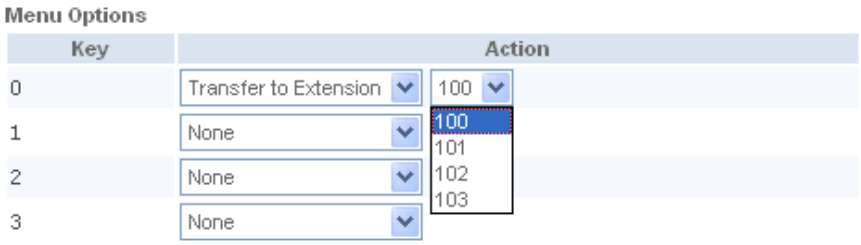

Figure 4.180 Menu Options – Transfer to Extension

- **Play Another Auto Attendant** Transfer to a different auto attendant. This action will only be available when more than one attendant exists. When defining this action, the screen refreshes, displaying a drop-down menu with all other available auto attendants. For example:

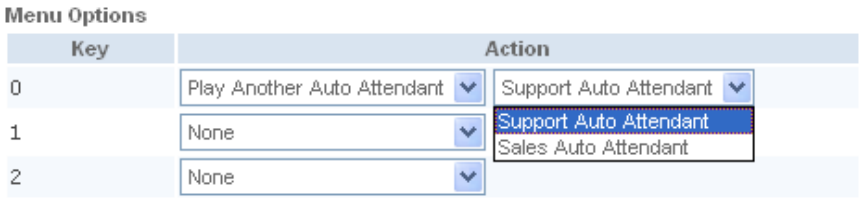

Figure 4.181 Menu Options – Play Auto Attendant

- **Replay Greeting** The greeting message will be replayed.

In the 'No Selection' drop-down menu, select "Play Another Auto Attendant". If the caller does select an action, at the end of the attendant's playback the only other auto attendant available at this time ('Main') will be played. Click 'OK' to save the settings.

Time to Wait for a Selection Specify the timeframe that the system will wait for the caller to select an action. After this timeframe, the action defined in the 'No Selection' menu option will occur.

2. Create a "Working Hours" auto attendant:
   Follow the above procedure to create yet another auto attendant, informing the caller of your office working hours. This auto attendant will be played in the timeframe which you will later on define as non-business hours.
   Important: Skip **Step 6** – the auto attendant will be replayed until the call is terminated.

3. Edit the 'Main' auto attendant as your main office attendant:

   a. Click the 'Main' auto attendant link. The 'Edit Auto Attendant' screen appears (see Figure 4.178).

   b. Type "Office" as the name for this auto attendant.

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c. Select 'Play Another Auto Attendant' for the **5** key (for example). The screen refreshes, displaying an additional combo box.

Figure 4.182 Menu Options – Play Auto Attendant

d. Select the 'Office Directions' auto attendant.

e. Press the 'Edit Greeting' button to record your main office message. This message should include the following directives:

- Inform the caller that he/she may dial an extension number at any time to be transferred to that extension.
- Inform the caller that he/she may press the **5** key to listen to directions on how to get to the office.

f. Click 'OK' to save the settings.

Your auto attendants are now ready to be used.

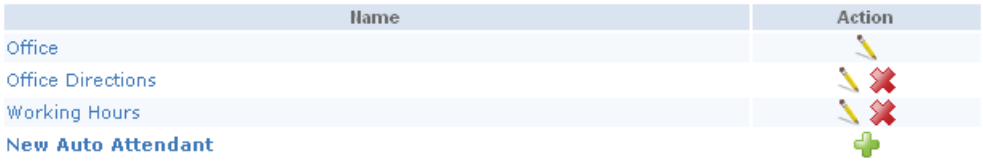

Figure 4.183 Newly Created Auto Attendants

4.6.7 Handling Incoming Calls

OpenRG can receive calls from the telephony proxies associated with its VoIP lines. Such calls will automatically be routed to the PBX through their respective lines. The PBX features an incoming call handling mechanism, enabling you to control your incoming calls per VoIP line, in both day and night modes. This is useful for handling business hours and off-hours calls differently. Since this feature is configured per VoIP line, you must first define one (refer to Section 4.6.5) in order to set its incoming call policy.

After you have created auto attendants, click the 'Incoming Calls' link in the PBX main screen (see Figure 4.154).

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Figure 4.184 Incoming Calls

As you can learn from this screen, by default VoIP accounts are configured to play the 'Main Auto Attendant', both day and night, Monday through Friday. Configuring this feature consists of two stages—defining incoming call handling for day and night modes, and scheduling the day mode (which automatically sets the night mode to the rest of the week cycle).

1. Define incoming call handling for day and night modes:

   a. In the 'Incoming Call Handling' section, click the 'Office' VoIP line (or its action icon). The 'Edit Incoming Call Handling' screen appears.

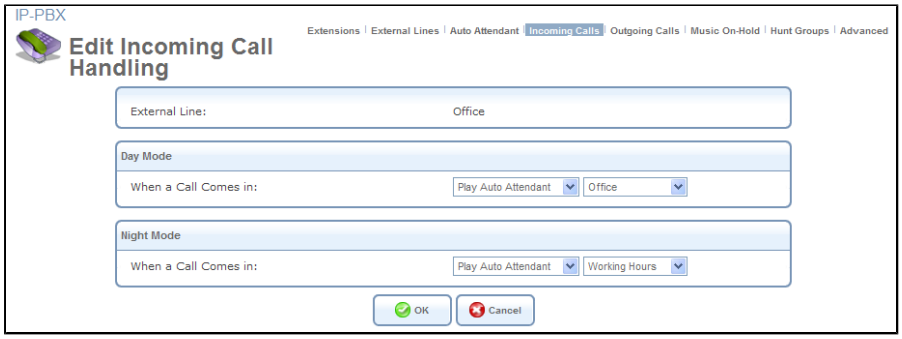

Figure 4.185 Edit Incoming Call Handling

   b. Configure the actions that will occur when a call arrives. The following instructions apply to both day and night modes, which are set in the same manner.

      Play Auto Attendant When this option is selected in the first drop-down menu, the second one displays a list of your available auto attendants.

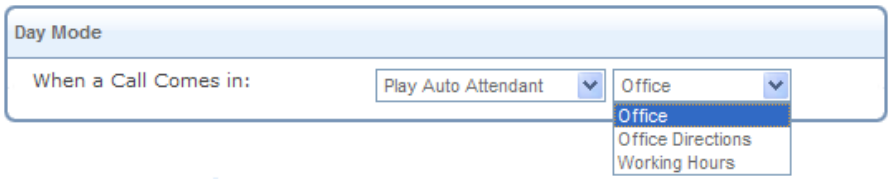

Figure 4.186 Play Auto Attendant

      Select to play the "Office" auto attendant in day mode, and the "Working Hours" auto attendant in night mode. Click 'OK' to save the settings.

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Transfer to Extension When this option is selected, the screen refreshes. The second drop-down menu displays a list of your available extensions, to which you can choose to route the call. Additionally, a check box appears.

Play Auto-Attendant If Busy or Unanswered Select this option if you would like to play an auto attendant in case the extension is busy or if the call is unanswered. The screen refreshes again, enabling you to select the auto attendant to be played.

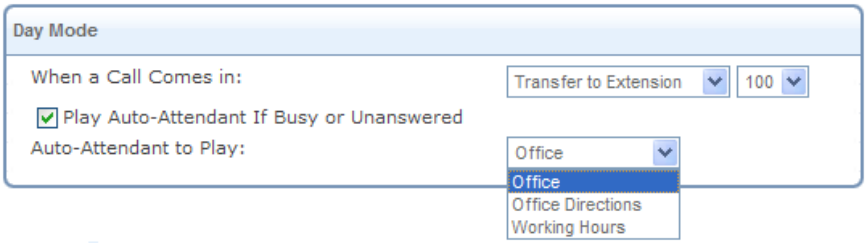

Figure 4.187 Transfer to Extension

c. Back in the 'Incoming Calls' screen, click the 'Home' VoIP line (or its action icon), and configure to transfer incoming calls to extension **100** in both day and night modes. Click 'OK' to save the settings.

2. Scheduling the day mode:
The 'Day Mode Schedule' section of the 'Incoming Calls' screen (see Figure 4.184) enables you to divide a week cycle into two time segments, during which incoming calls can be handled differently. Only one segment must be configured (the "day" mode), as the rest of the time in the week cycle will be referred to as the second segment (the "night" mode). Determine the day mode time segment:

   Days of Week Select from which day through which day will be included in this mode.

   Hours Range Enter from what hour to what hour of every day will be included in this mode.

Your incoming call handling plan should be as follows:

Figure 4.188 Incoming Call Handling

- When a call arrives through the office VoIP line in business hours, the main "Office" attendant will be played, prompting the user to dial any extension number or to press **5** for instructions on how to get to the office. To experience this, you can use the home extension to dial "9" and then your office VoIP line number.

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- When a call arrives through the office VoIP line in off-hours, the "Working Hours" attendant will be played, informing the caller of your business hours.

- When a call arrives through the home VoIP line, it will automatically be transferred to extension **100**. To experience this, you can use the office extension to dial "9" and then your home VoIP line number.

4.6.8 Handling Outgoing Calls

OpenRG's PBX provides a sophisticated mechanism for handling outgoing calls, by utilizing a *Dial Plan*. A dial plan is a set of rules you can determine in order to route outgoing calls through specific VoIP lines. Each dial plan rule is referred to as a "dial plan entry", which you can add, edit or remove.

The dial plan mechanism enables you to manipulate the number dialed by the caller, by adding or omitting digits. This can be used for various purposes, such as reaching an external line, replacing telephony proxies' dialing codes, and even defining speed dial shortcuts. To define a new dial plan entry, click the 'New Dial Plan Entry' link. The 'Edit Dial Plan Entry' screen appears (see Figure 4.190).

Click the 'Outgoing Calls' link in the PBX main screen (see Figure 4.154). The following screen appears.

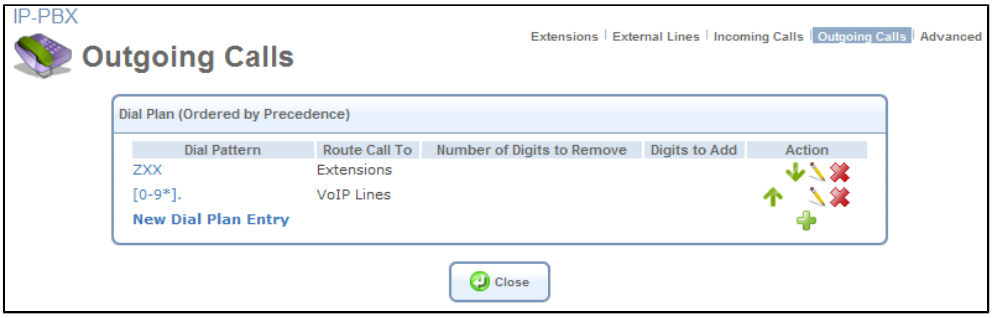

Figure 4.189 Outgoing Calls

The default entries are designed to handle the most common call patterns. Click the 'ZXX' entry (or its action icon). The 'Edit Dial Plan Entry' screen appears.

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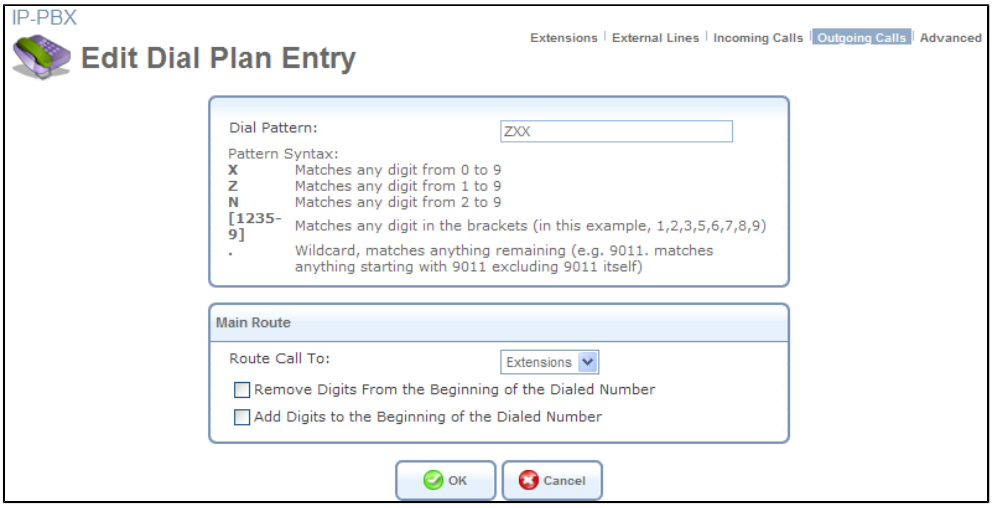
IP-PBX
Edit Dial Plan Entry
Extensions | External Lines | Incoming Calls | Outgoing Calls | Advanced
Dial Pattern:
ZXX
Pattern Syntax:
X Matches any digit from 0 to 9
Z Matches any digit from 1 to 9
N Matches any digit from 2 to 9
[1235-9] Matches any digit in the brackets (in this example, 1,2,3,5,6,7,8,9)
. Wildcard, matches anything remaining (e.g. 9011. matches anything starting with 9011 excluding 9011 itself)
Main Route
Route Call To:
Extensions
Remove Digits From the Beginning of the Dialed Number
Add Digits to the Beginning of the Dialed Number
OK
Cancel

Figure 4.190 Edit Dial Plan Entry

This screen is divided into two main sections–'Dial Pattern', used for setting the variable for dialed numbers, and 'Main Route', used for determining the routing behavior. "ZXX" is a variable for a dial pattern of three digits, where the first is between 1 and 9 and the second and third are between 0 and 9. This pattern covers all extension numbers. When a caller from any extension dials a number that matches this dial pattern, the PBX will route the call to the relevant extension. Similarly, the "[0-9*]." dial pattern is a variable for any number of digits that when dialed, the call will be routed to an external line through the default 'VoIP Lines' group.

As you have obtained an FWD SIP account in previous examples, you may want to use the dial plan to overcome an FWD limitation. As a rule, FWD requires dialing " ***** " (asterisk) as a prefix to 1-800 numbers. Failure to do so will result in an FWD voice message explaining this requirement. To override this limitation, add the following entry to the dial plan.

1. In the 'Outgoing Calls' screen (see Figure 4.189) click the 'New Dial Plan Entry' link. The 'Edit Dial Plan Entry' screen appears.

2. Enter "91800XXXXXXX" as the dial pattern. This pattern represents every possible 1-800 number, dialed after "9" (for an external call), and complies with the specified pattern syntax.

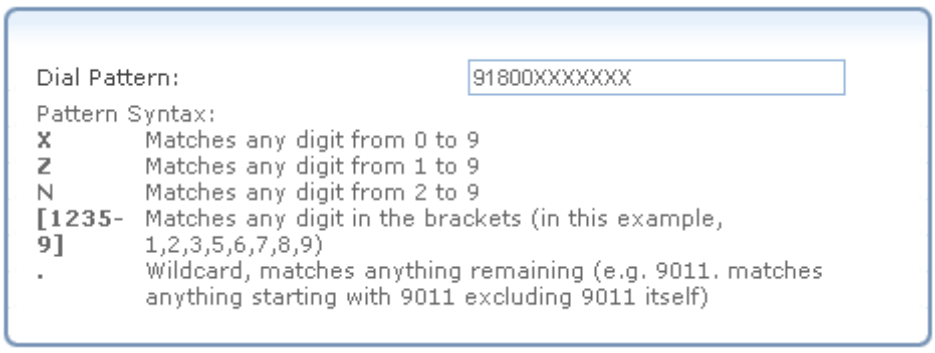
Dial Pattern:
91800XXXXXXX
Pattern Syntax:
X Matches any digit from 0 to 9
Z Matches any digit from 1 to 9
N Matches any digit from 2 to 9
[1235-9] Matches any digit in the brackets (in this example, 1,2,3,5,6,7,8,9)
. Wildcard, matches anything remaining (e.g. 9011. matches anything starting with 9011 excluding 9011 itself)

Figure 4.191 Dial Pattern

3. In the 'Main Route' section, configure the following:

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Line Group to Use Select the line group through which you would like to route the call. In this example, select "VoIP Lines".

Remove Digits From the Beginning of the Dialed Number Select this option to ignore one or more of the digits specified in the dial pattern before dialing the telephone number. When this option is selected, the screen refreshes, adding the following field:

Number of Digits to Remove Verify that the value of this field is 1.

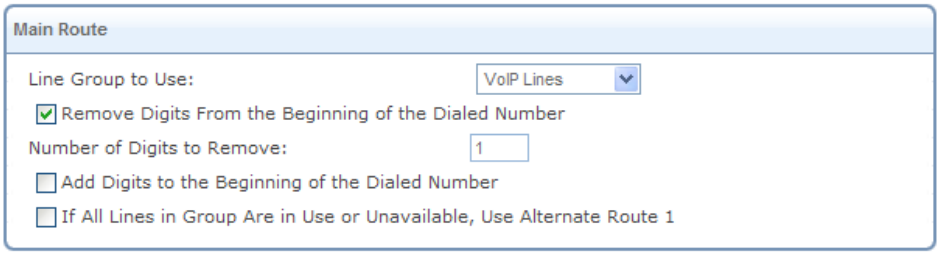
Main Route
Line Group to Use:
VoIP Lines
Remove Digits From the Beginning of the Dialed Number
Number of Digits to Remove:
1
Add Digits to the Beginning of the Dialed Number
If All Lines in Group Are in Use or Unavailable, Use Alternate Route 1

Figure 4.192 Number of Digits to Remove

Add Digits to the Beginning of the Dialed Number Select this option to add digits before dialing the telephone number. When this option is selected, the screen refreshes, adding the following field:

Digits to Add Enter an " ***** " (asterisk) as the digit to be added.

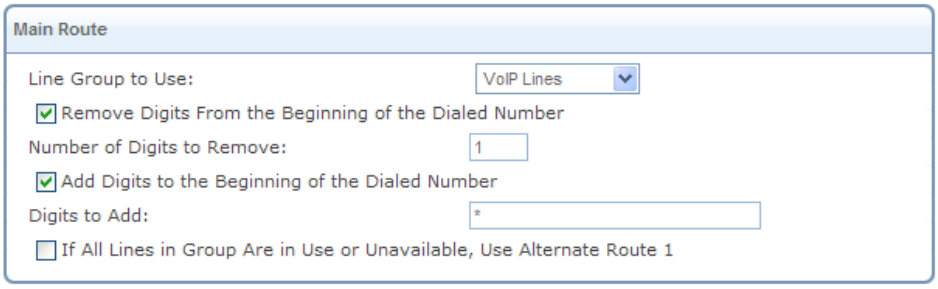
Main Route
Line Group to Use:
VoIP Lines
Remove Digits From the Beginning of the Dialed Number
Number of Digits to Remove:
1
Add Digits to the Beginning of the Dialed Number
Digits to Add:
*
If All Lines in Group Are in Use or Unavailable, Use Alternate Route 1

Figure 4.193 Digits to Add

If All Lines in Group Are in Use or Unavailable, Use Alternate Route 1 Select this option to provide an alternate route for the dialed call, in case all lines in the specified line group are in use (this step is not mandatory for the current example). When this option is selected, the screen refreshes, adding the following section:

Alternate Route 1 This section is identical to the 'Main Route' section above, enabling you to select a different set of parameters, thus expanding a call's routing options. You can further select the alternate route option, to create Alternate Route 2, and so on.

Note: On the Broadcom BCM96358 platform, this screen section is enabled by default, and the 'Telephone Lines' group (analog lines) is selected. This is useful if the Internet connection is down, in which case all the VoIP lines are

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unavailable. In such a case, a dialed external call will be routed by default to the analog (PSTN) line via an FXO port.

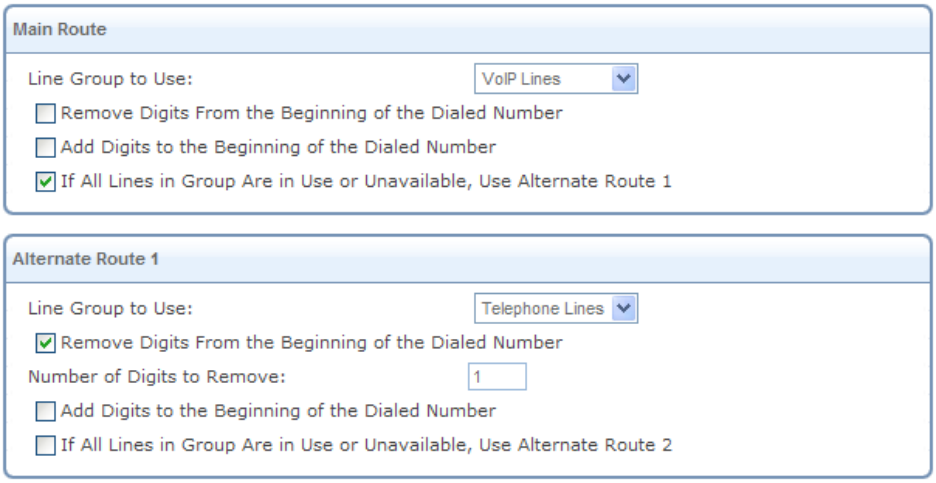
Main Route
Line Group to Use:
VoIP Lines
Remove Digits From the Beginning of the Dialed Number
Add Digits to the Beginning of the Dialed Number
If All Lines in Group Are in Use or Unavailable, Use Alternate Route 1
Alternate Route 1
Line Group to Use:
Telephone Lines
Remove Digits From the Beginning of the Dialed Number
Number of Digits to Remove:
1
Add Digits to the Beginning of the Dialed Number
If All Lines in Group Are in Use or Unavailable, Use Alternate Route 2

Figure 4.194 Alternate Route 1

4. Click 'OK' to save the settings.

The dial plan entry is added to the 'Outgoing Calls' screen, and is applied on all VoIP lines in the line group selected (in this case, the default 'VoIP Lines' group).

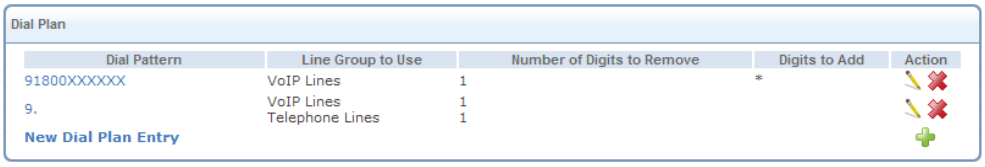

Figure 4.195 Dial Plan

Calls dialed from OpenRG to 1-800 numbers will now be automatically converted into the format required by FWD, concealing its limitation and simplifying telephony operability.

4.6.9 Using the Voice Mail

Note: This feature is only available with the Full PBX version.

The voice mail feature is an interactive attendant application, enabling you to listen to your messages and configure various voice mail options.

4.6.9.1 Accessing the Voice Mail

Every extension features its own voice mailbox. The PBX will indicate that you have messages by commencing the dial tone with a stutter when you pick up the handset. To access an extension's voice mail application, perform the following:

1. Pick up the handset, and dial ***1234**. An attendant will ask for a password.

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2. Dial your password. The default password is **0000#**.

As soon as you enter the voice mail application, the attendant will inform you whether you have any messages, and prompt you to press different keys for various mail options. Navigate through these options to perform all voice mail operations.

4.6.9.2 Voice Mail Operations

Following are the available voice mail operations and their corresponding keys. Sub-options are marked with bullets.

1 – New/old messages

- **4** – Play previous message
- **5** – Repeat current message
- **6** – Play next message
- **7** – Delete current message
- **8** – Forward message to another mailbox
- **9** – Save message in a folder
- ***** – Help; during message playback: rewind
- **#** – Exit; during message playback: fast-forward

2 – Change folders

3 – Advanced options

- **1** – Send reply
- **2** – Call back
- **3** – Envelope
- **4** – Outgoing call
- **5** – Leave message
- ***** – Return to main menu

0 – Mailbox options

- **1** – Record your "unavailable" message
- **2** – Record your "busy" message

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- **3** – Record your name
- **4** – Change your password
- ***** – Return to the main menu

***** – Help

– Exit

4.6.9.2.1 An Example – Reaching an External Line

In this example you will add an entry that provides the option to press "9" for an external line.

1. Click the 'New Dial Plan Entry' link. The 'Edit Dial Plan Entry' screen appears.

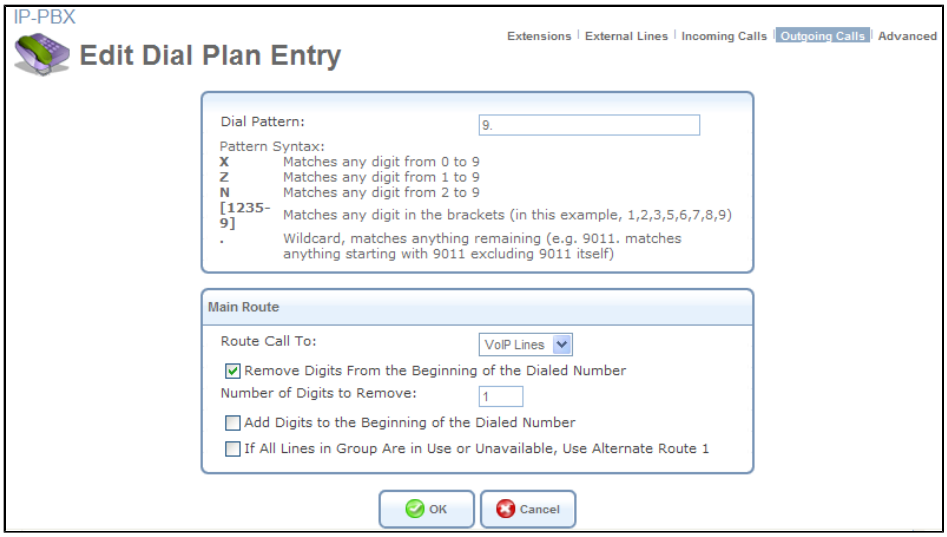
IP-PBX
Edit Dial Plan Entry
Extensions | External Lines | Incoming Calls | Outgoing Calls | Advanced
Dial Pattern:
9.
Pattern Syntax:
X Matches any digit from 0 to 9
Z Matches any digit from 1 to 9
N Matches any digit from 2 to 9
[1235-9] Matches any digit in the brackets (in this example, 1,2,3,5,6,7,8,9)
. Wildcard, matches anything remaining (e.g. 9011. matches anything starting with 9011 excluding 9011 itself)
Main Route
Route Call To:
VoIP Lines
Remove Digits From the Beginning of the Dialed Number
Number of Digits to Remove:
1
Add Digits to the Beginning of the Dialed Number
If All Lines in Group Are in Use or Unavailable, Use Alternate Route 1
OK
Cancel

Figure 4.196 Edit Dial Plan Entry

2. In the 'Dial Pattern' field, enter "9."
3. In the 'Route Call To' field select "VoIP Lines".
4. Select the 'Remove Digits From the Beginning of the Dialed Number' check box. The screen refreshes, and the 'Number of Digits to Remove' line is added with a value of 1.
5. Click 'OK' to save the settings.

According to this dial plan entry, when a caller dials "9", the call will be routed to an external line through the default 'VoIP Lines' group, and the dialed "9" digit will be omitted. The caller will then be able to place an external call by simply dialing the desired telephone number.

4.6.10 Adding On-Hold Music Files

Note: This feature is only available with the Full PBX version.

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While callers are placed on hold, they will hear background music playing. In order to use OpenRG's default music or upload your own music files, you must first connect an external storage device to your board. To upload an on-hold music file, perform the following:

1. Click the 'Music On-Hold' link in the PBX main screen (see Figure 4.154). The following screen appears.

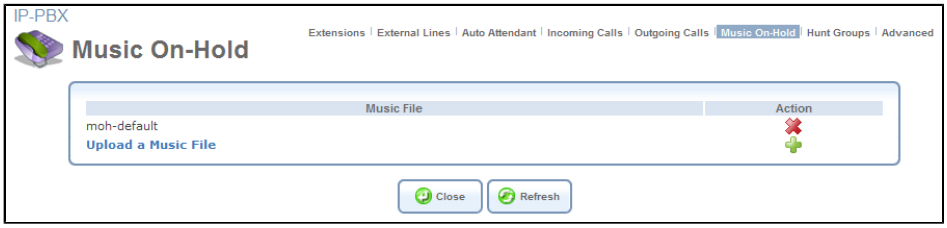

Figure 4.197 Music On-Hold

2. Click the 'Upload a Music File' link. The following screen appears.

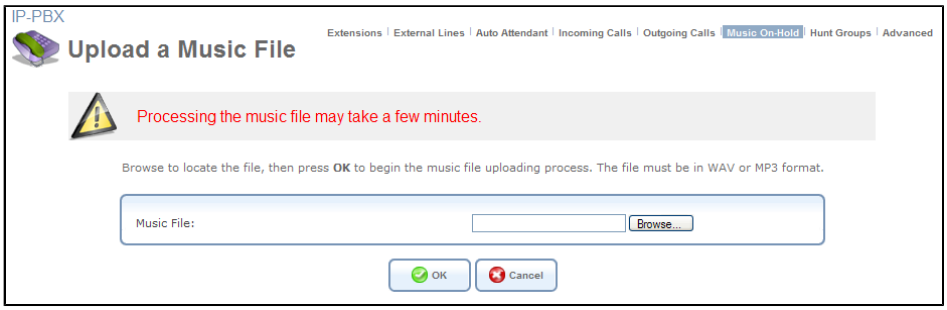
IP-PBX
Upload a Music File
Extensions | External Lines | Auto Attendant | Incoming Calls | Outgoing Calls | Music On-Hold | Hunt Groups | Advanced
Processing the music file may take a few minutes.
Browse to locate the file, then press OK to begin the music file uploading process. The file must be in WAV or MP3 format.
Music File:
Browse...
OK
Cancel

Figure 4.198 Browse For a Music File

3. Click the 'Browse' button to open a browsing window on your computer and select the WAV or MP3 format file to upload.

4. Click 'OK' to begin the upload. Note that this may take several minutes, depending on the size of your file(s).

4.6.11 Automating Call Distribution with Hunt Groups

Note: This feature is only available with the Full PBX version.

Your PBX features *Hunt Groups* for automating distribution of incoming calls to two or more extensions. This allows you to set up groups of operators in order to handle different types of inquiries. For example, you may distribute calls to a **sales hunt group** and a **support hunt group**. Moreover, you can control the distribution of calls within a hunt group in a particular order if an extension is busy or unavailable.

Since hunt groups are groups of extensions, once defined they become optional call recipients. The option "Transfer to Hunt Group" will be added as a menu option in the 'Edit Auto

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Attendant' screen (see Figure 4.199) and in the 'Edit Incoming Call Handling' screen (see Figure 4.200).

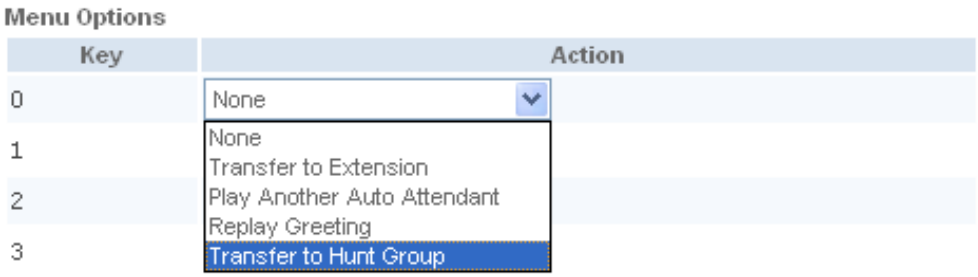

Figure 4.199 Edit Auto Attendant

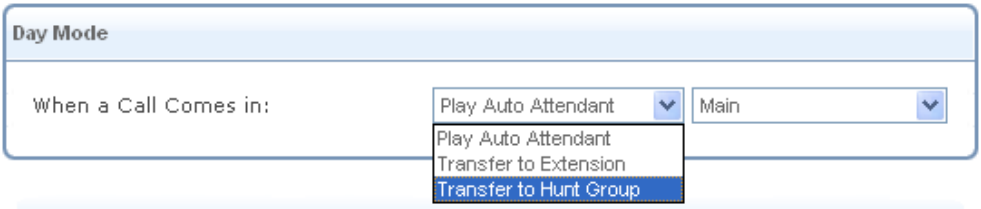

Figure 4.200 Edit Incoming Call Handling

To define a hunt group, click the 'Hunt Groups' link in the PBX main screen (see Figure 4.154). The following screen appears.

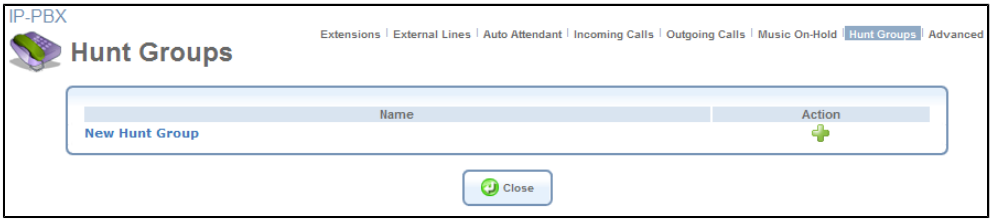
IP-PBX
Hunt Groups
Extensions | External Lines | Auto Attendant | Incoming Calls | Outgoing Calls | Music On-Hold | Hunt Groups | Advanced
Name
Action
New Hunt Group
Close

Figure 4.201 Hunt Groups

Click the 'New Hunt Group' link. The following screen appears.

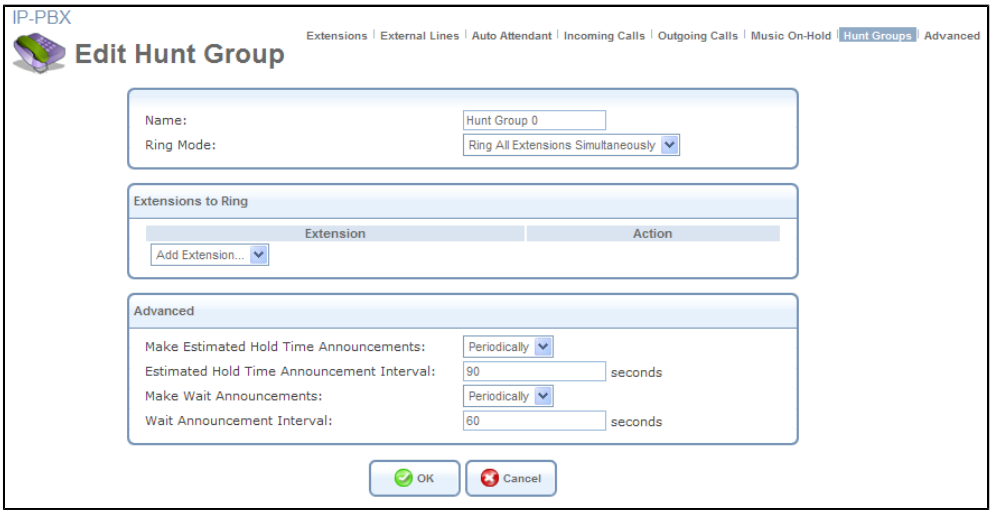

Figure 4.202 Edit Hunt Group

Name The name of the hunt group.

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Ring Mode Select whether to ring all extensions at once when a call arrives, where the first operator to answer will accept the call, or to ring one extension at a time in an orderly fashion. Selecting the second choice will refresh the screen.

Figure 4.203 Hunt Group Ring Mode

Time to Ring Each Extension Enter the timeframe in which the call will ring on each extension before being routed to the next.

Extensions to Ring Select the extensions that will participate in this hunt group. The drop-down menu will display all of your available extensions. Note that this step is mandatory, otherwise the hunt group is empty. If you had chosen to ring one extension at a time as your ring mode, by default the ring will be routed between the extensions in their order of appearance in this table. When adding multiple extensions, the action icon and action icon appear, allowing you to easily change the order of the extensions. If you had chosen simultaneous rings, the order of extensions is not relevant.

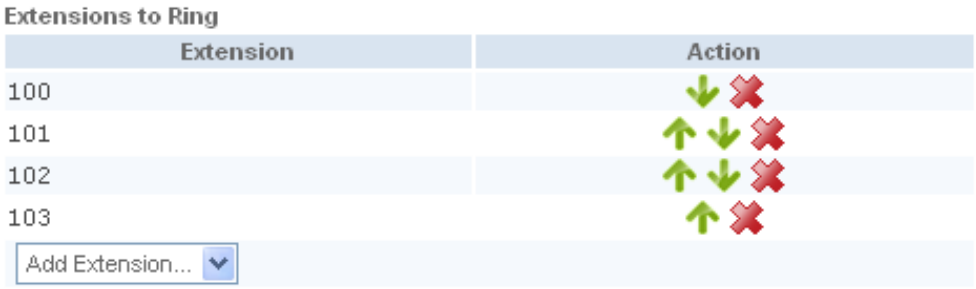

Figure 4.204 Extensions to Ring

Ring Order The ringing cycle order, used to determine the cycle's starting point, or which extension will ring first. This field appears only if you had chosen to ring one extension at a time as your ring mode. In this mode, the extensions will ring one after the other in a cyclic manner, according to their order in the 'Extensions to Ring' table. Select the ring order algorithm to be used:

- Round Robin – The extensions take orderly turns at being the first extension to ring. The order of the turns is the same order defined for the ringing cycle.
- Least Recent – The first extension to ring is the one that has been idle for the longest time.
- Random – The first extension to ring will be chosen randomly.

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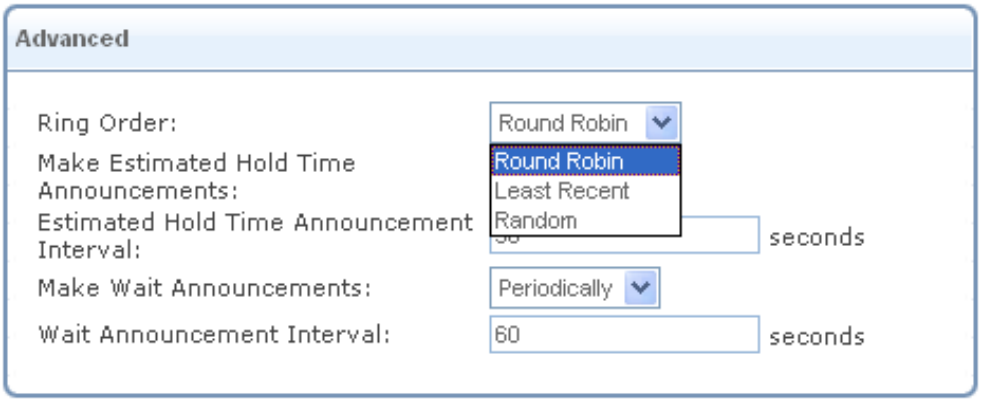

Figure 4.205 Ring Order

Make Estimated Hold Time Announcements Hold time announcements include messages asking the callers to hold, as well as informing the callers of their number in the queue of calls. These messages are played in addition to the on-hold music played in the background. Select whether to play these messages periodically, once, or not at all.

Estimated Hold Time Announcement Interval Enter the number of seconds before the hold time announcements will be repeated. Note that if you had chosen to play the announcements once or not at all, this field will not be visible.

Make Wait Announcements Wait announcements are messages asking the caller to hold. Select whether to play this message periodically or not at all.

Wait Announcement Interval Enter the number of seconds before the wait announcement will be repeated. Note that if you had chosen not to play the announcement at all, this field will not be visible.

Note: When an external caller is transferred to a relevant hunt group without dialing a specific hunt group's extension, the calling features of the reached extension (such as call waiting, call forwarding, etc.) are not activated. This is done in order to automatically transfer the call to the next hunt group's extension, if the previously called extension does not answer. In contrast, when a specific hunt group's extension is requested, its calling features are activated, and the call is not transferred further within the hunt group when the dialed extension does not answer.

4.6.12 Advanced Telephony Options

The 'Advanced' screen enables configuration of advanced settings. Some of these settings are platform-specific, and therefore may not be available with your gateway's software.

4.6.12.1 Configuring Voice Mail Attributes

Note: This feature is only available with the Full PBX version.

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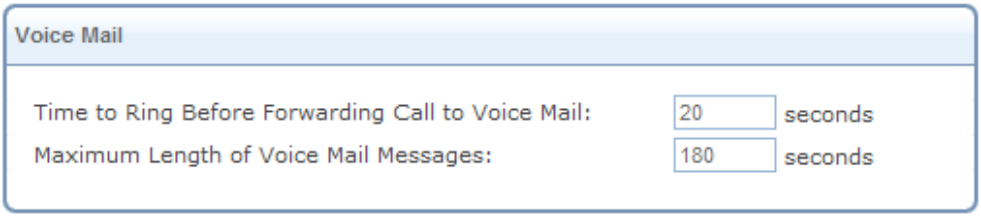

Figure 4.206 Advanced – Voice Mail

Time to Ring Before Forwarding Call to Voice Mail The timeframe in seconds until the call will be forwarded to the voice mail.

Maximum Length of Voice Mail Messages The maximal length in seconds of a message that can be recorded.

4.6.12.2 Switching Extensions with Call Park

Note: This feature is only available with the Full PBX version.

Call parking allows you to put a call on hold at one extension and continue the conversation from any other extension on your PBX.

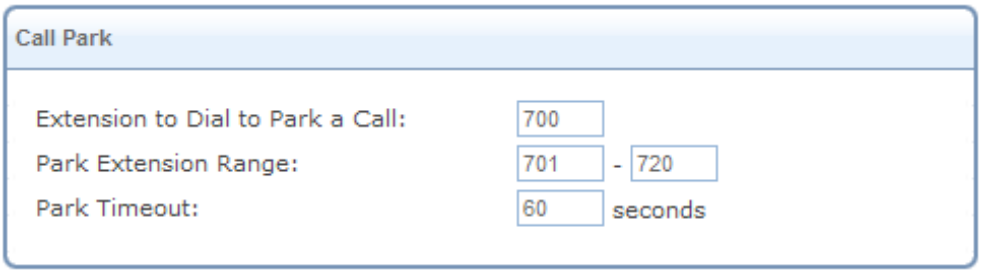

Figure 4.207 Advanced – Call Park

Extension to Dial to Park a Call The extension number that must be dialed in order to park the call. When dialing this number, a voice recording will say a parking extension number that you must dial from any other extension on the PBX in order to resume the parked call.

Park Extension Range The range of parking extension numbers that are available for the system to provide a caller parking a call.

Park Timeout The duration (in seconds) for which the call is parked. During this timeframe, the call can be picked up from any extension on the PBX by dialing the parking extension number provided. After this timeframe, the extension from which the call was parked will ring to resume the call.

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4.6.12.3 Setting the SIP Port

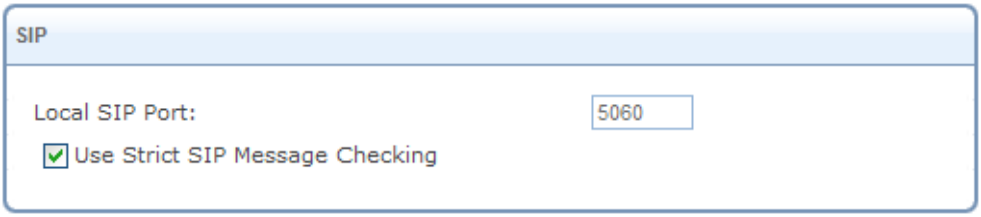

Figure 4.208 Advanced – SIP

Local SIP Port The port on OpenRG that listens to SIP requests from the proxy. By default, port 5060 is used for SIP signaling of phones connected to the gateway. A common problem occurs when using a SIP agent on the LAN (for example, an IP phone). A SIP agent requires port forwarding configuration (refer to Section 4.2.3), which uses the same port—5060. This multiple use of the port causes failure of either or both services. Therefore, when configuring port forwarding for a SIP agent, you must change OpenRG's SIP port value (for example, to 5062). Note that the calling party must be made aware of this value when initiating a direct call (not using a proxy).

4.6.12.4 Configuring H.323 Parameters

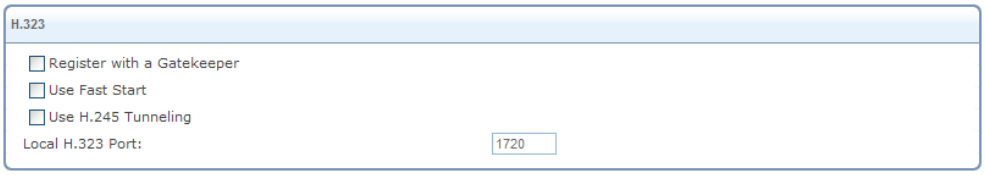

Figure 4.209 Advanced – H.323

Register with a Gatekeeper Register the user with a gatekeeper, allowing other parties to call the user through the gatekeeper. When this item is checked, the following fields become visible:

Gatekeeper Address The IP address or name of the primary gatekeeper.

Gatekeeper Port The port on which the primary gatekeeper is listening for connections.

Specify Gatekeeper ID Select whether a gatekeeper ID should be used for the primary H.323 gatekeeper.

Gatekeeper ID The identifier for the primary H.323 gatekeeper.

Registration Time to Live Specify the valid duration of the H.323 gatekeeper registration in seconds.

Use Alternate Gatekeeper Select this check-box to configure an alternate gatekeeper for redundancy. When this item is checked, the following fields become visible:

Alternate Gatekeeper Address The IP address or name of the alternate gatekeeper.

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Alternate Gatekeeper Port The port on which the alternate gatekeeper is listening for connections.

Use Fast Start The fast start connection method can result in quicker connection establishment, depending on the remote party's settings. Note that Microsoft NetMeeting does not support this option, so in order to interoperate with Microsoft NetMeeting, you should disable the feature.

Use H.245 Tunneling Indicates whether H.245 packets should be encapsulated within H.225 packets.

Local H.323 Port Specify the port number to use for H.323 signaling.

DTMF Transmission Method DTMFs are the tones generated by your telephone's keypad.

- **Inband** The DTMF keypad tones are sent within the voice stream.
- **Out-of-Band Always (RFC2833)** The DTMF keypad tones are represented by the keypad number and are sent as separate packets. This is a more reliable transmission method.
- **Q.931 Keypad** The DTMF keypad tones are sent using Q.931 messages.
- **H.245 Alphanumeric** The DTMF keypad tones are sent using an H.245 alphanumeric Information Element (IE).
- **H.245 Signal** The DTMF keypad tones are sent using an H.245 signal IE.

4.6.12.5 Setting the MGCP Port

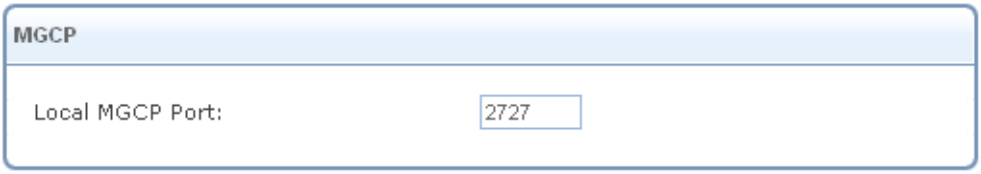

Figure 4.210 Advanced – MGCP

Local MGCP Port The port OpenRG uses for MGCP connections.

4.6.12.6 Selecting Audio Codecs

Audio codecs define the method of relaying voice data. Different codecs have different characteristics, such as data compression and voice quality. For example, G.723 is a codec that uses compression, so it is good for use where bandwidth is limited but its voice quality is not as good compared to other codecs such as the G.711.

To select the audio codecs, click the 'Advanced' link under the 'Voice' item menu. In the 'Codecs' section, configure the following options.

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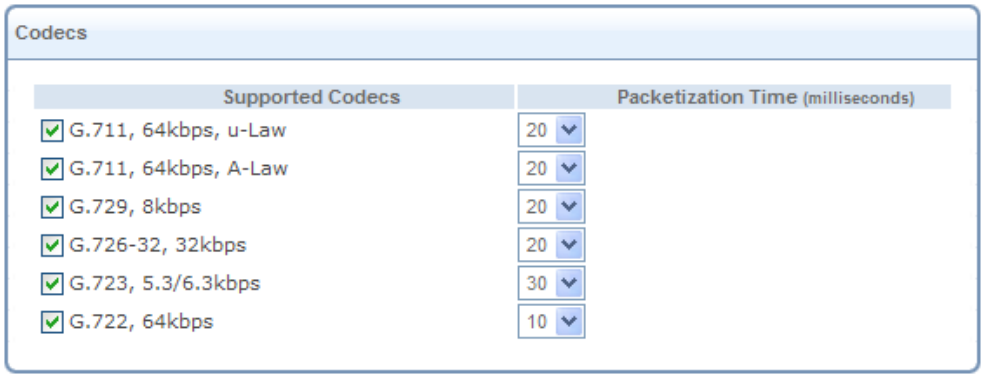

Figure 4.211 Advanced – Codecs

Supported Codecs In order to make a call, at lease one codec must be enabled. Moreover, all codecs may be enabled for best performance. When you start a call to a remote party, your available codecs are compared against the remote party's, to determine which codec will be used. The priority by which the codecs are compared is according to the descending order of their list, as depicted in the figure above. If there is no codec that both parties have made available, the call attempt will fail. Note that if more than one codec is common to both parties, you cannot force which of the common codecs that were found will be used by the remote party's client. If you do wish to force the use of a specific codec, leave only that codec checked.

Packetization Time The Packetization Time is the length of the digital voice segment that each packet holds. The default is 20 millisecond packets. Selecting 10 millisecond packets enhances the voice quality, as less information is lost due to packet loss, but doubles the load on the network traffic.

Note: This feature is only available with the Home PBX version. The Full version of PBX utilizes only the **G.711 u-LAW** codec, which cannot be changed or disabled from the WBM.

4.6.12.7 Changing the Reserved RTP Port Range

The voice stream is transmitted in Real Time Protocol (RTP) packets, which require a range of open ports. If the default ports are required for another application, you can enter a different start port, thus creating a new range. To change the start port, configure the following option in the 'RTP' section.

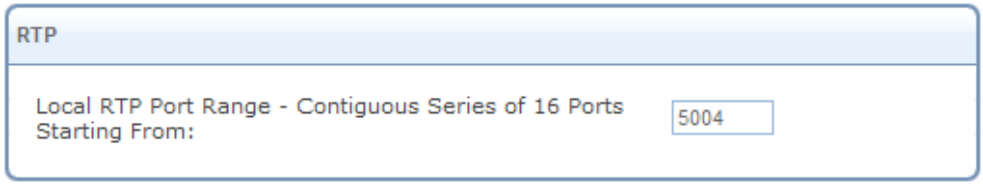

Figure 4.212 Advanced – RTP

Local RTP Port Range The range of ports reserved for Real Time Protocol (RTP) voice transport.

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4.6.12.8 Configuring Quality of Service Parameters

Quality of Service (QoS) is aimed at improving the quality of voice traffic. To configure the QoS parameters, click the 'Advanced' link under the 'Voice' menu item. In the 'Quality of Service' section, configure the following options.

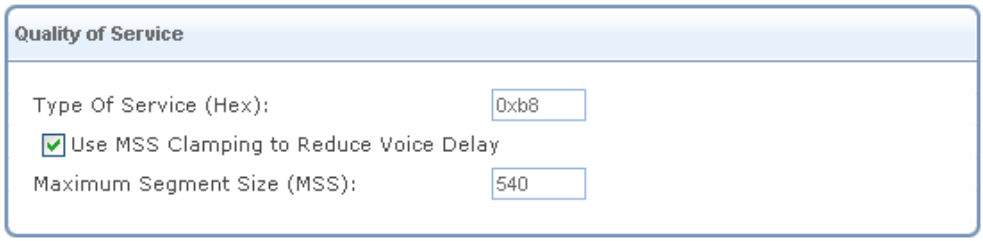

Figure 4.213 Advanced – Quality of Service

Type of Service (HEX) This is a part of the IP header that defines the type of routing service to be used to tag outgoing voice packets originated from OpenRG. It is used to tell routers along the way that this packet should get specific QoS. Leave this value as 0XB8 (default) if you are unfamiliar with the Differentiated Services IP protocol parameter.

Use MSS Clamping to Reduce Voice Delay When using Maximum Segment Size (MSS) Clamping, TCP streams routed via OpenRG when a voice call is active, will have a smaller segment size. This will cause RTP to receive better priority, and will help prevent high voice jitter that is caused by slow upstream transmission rate, which is common with most WAN connections (DSL, DOCSIS, etc.). When checking this option, the 'Maximum Segment Size (MSS)' field appears, where you can change the maximal segment size.

4.6.12.9 Configuring Dial Codes for Call Features

The 'Feature Codes' section enables you to view and customize activation codes for various call forwarding features.

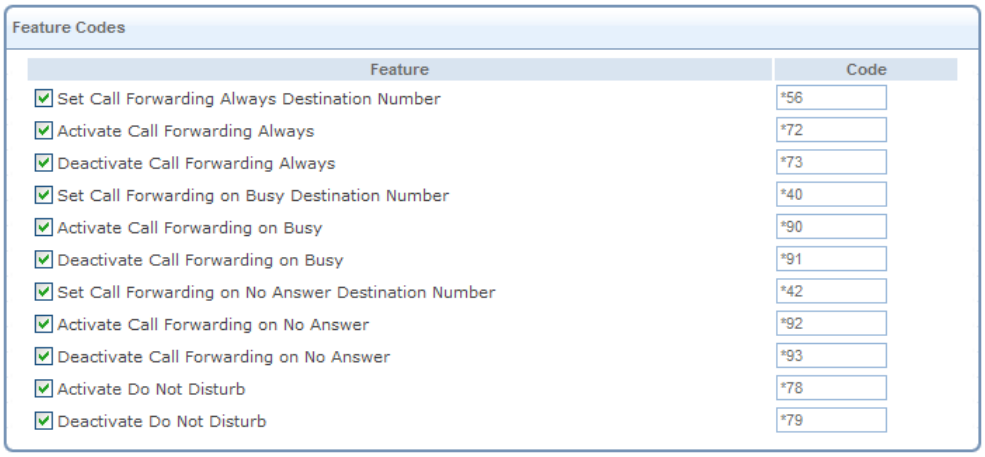

Figure 4.214 Feature Codes

Set Call Forwarding Always Destination Number Enables you to set an alternate destination number for all incoming calls, by entering **<extension number>#** after the feature's

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code (*56 by default). For example, to set extension 300 as a destination number, dial *56300#. You will hear a voice confirmation for setting a destination number.

Activate Call Forwarding Always Forwards all incoming calls to a predefined extension. If you have not dialed a destination number when configuring the previous setting, a voice message will notify you accordingly. In this case, set a destination number as described earlier, prior to enabling the 'Activate Call Forwarding Always' feature. After dialing the code (*72 by default), you will hear a voice confirmation for the feature's activation.

Deactivate Call Forwarding Always Deactivates the 'Call Forwarding Always' feature. After dialing the code (*73 by default), you will hear a voice confirmation for 'Call Forwarding Always' deactivation.

Set Call Forwarding on Busy Destination Number Enables you to set an alternate destination for incoming calls, which are directed to a busy extension. After dialing the code (*40 by default), enter an extension number followed by "#". After dialing this sequence, you will hear a voice confirmation for setting the destination number.

Activate Call Forwarding on Busy Redirects a caller to an alternate extension, whenever the original target extension is busy. If you have not dialed a destination number when configuring the previous setting, a voice message will notify you accordingly. In this case, set a destination number as described earlier, prior to enabling the 'Call Forwarding on Busy' feature. After dialing the code (*90 by default), you will hear a voice confirmation for the feature's activation. Note that this feature is relevant only if the 'Call Forwarding Always' feature is deactivated.

Deactivate Call Forwarding on Busy Deactivates the 'Call Forwarding on Busy' feature. After dialing the feature's code (*91 by default), you will hear a voice confirmation for 'Call Forwarding on Busy' deactivation.

Set Call Forwarding on No Answer Destination Number Enables you to set an alternate destination number for incoming calls directed to an extension, which does not answer within a specific timeframe (by default, 20 seconds). Dial a destination number as described earlier, after the feature's code (*42 by default). You will hear a voice confirmation for setting the destination number.

Activate Call Forwarding on No Answer Redirects a caller to a alternate extension, whenever the original target extension does not answer within a specific timeframe. If you have not dialed a destination number when configuring the previous setting, a voice message will notify you accordingly. In this case, set a destination number as described earlier, prior to enabling the 'Call Forwarding on No Answer' feature. After dialing the code (*92 by default), you will hear a voice confirmation for the feature's activation. Note that this feature is relevant only if the 'Call Forwarding Always' feature is deactivated.

Deactivate Call Forwarding on No Answer Deactivates the 'Call Forwarding on No Answer' feature. After dialing the feature's code (*93 by default), you will hear a voice confirmation for 'Call Forwarding on No Answer' deactivation.

Activate Do Not Disturb Prevents calls from reaching a target extension. The caller will be forwarded to the extension's voice mail. After dialing the feature's code (*78 by default), you will hear a voice confirmation for the feature's activation.

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Deactivate Do Not Disturb Cancels redirection of callers to the voice mail, and makes the target extension available for incoming calls. After dialing the feature's code (*79 by default), you will hear a voice confirmation for the feature's deactivation.

Note: You can forward calls to external numbers by including an appropriate prefix. For example, if the prefix for external calls is '9', then by dialing *5691800555555#, you can forward calls to 1-800-555-555.

If either 'Call Forwarding Always' or 'Do Not Disturb' is activated, you will hear a stutter dial tone when picking up a phone connected to an analog extension.

4.6.12.10 Improving Voice Reception with Echo Cancellation

Echo cancellation is the elimination of reflected signals (echoes) made noticeable by delay in the network. This also improves the bandwidth of the line. When the delay of a voice call exceeds acceptable limits, OpenRG will protect the far end from receiving any echo generated at the local end and sent back through the network.

Note: This feature is currently available on the following platforms: Intel IXP425, Broadcom BCM96358, and on platforms with the VINETIC chipset.

To improve voice reception with echo cancellation, click the 'Advanced' link under the 'Voice' item menu. In the 'Echo Cancellation' section, configure the following options.

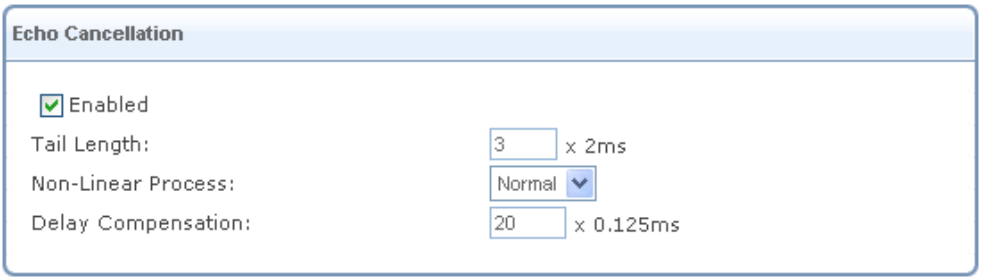

Figure 4.215 Advanced – Echo Cancellation

Enabled Select or deselect this check box to enable or disable this feature.

Tail Length Defines the length of the elapsed time frame used for calculating the extrapolation of the echo cancellation. A long tail improves the echo cancellation, but increases the load on the Digital Signal Processor (DSP).

Non-Linear Process (NLP) Determines the type of calculation that is used for removing the echo effect. You can set this feature to Normal, High or Off. Using high NLP improves the echo cancellation, but increases the load on the DSP.

Delay Compensation A time delay compensating the echo cancellation.

Note: On some platforms, the feature's graphic interface may differ from the one presented in the above figure.

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4.6.12.11 Saving Bandwidth with Silence Suppression

Silence suppression enables optimization when no speech is detected. With this feature enabled, OpenRG is able to detect the absence of audio and conserve bandwidth by preventing the transmission of "silent packets" over the network.

To save bandwidth with silence suppression, click the 'Advanced' link under the 'Voice' item menu. In the 'Silence Suppression' section, configure the following options.

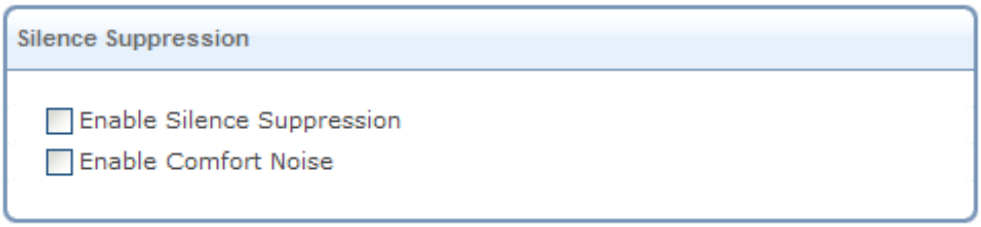

Figure 4.216 Advanced – Silence Suppression

Enable Silence Suppression Select this check box to enable this feature.

Enable Comfort Noise Select this option to play a soft "comfort" noise if the other side is performing silence suppression, in order to signal your caller that the conversation is still active.

4.6.12.12 Avoiding Voice Distortion with Jitter Buffer

A Jitter Buffer is a shared data area where voice packets can be collected, stored, and sent to the voice processor in evenly spaced intervals. Variations in packet arrival time, called "jitter", can occur because of network congestion, timing drift, or route changes. The jitter buffer intentionally delays the arriving packets so that the end user experiences a clear connection with very little voice distortion.

To avoid voice distortion with jitter buffer, click the 'Advanced' link under the 'Voice' item menu. In the 'Jitter Buffer' section, configure the following options.

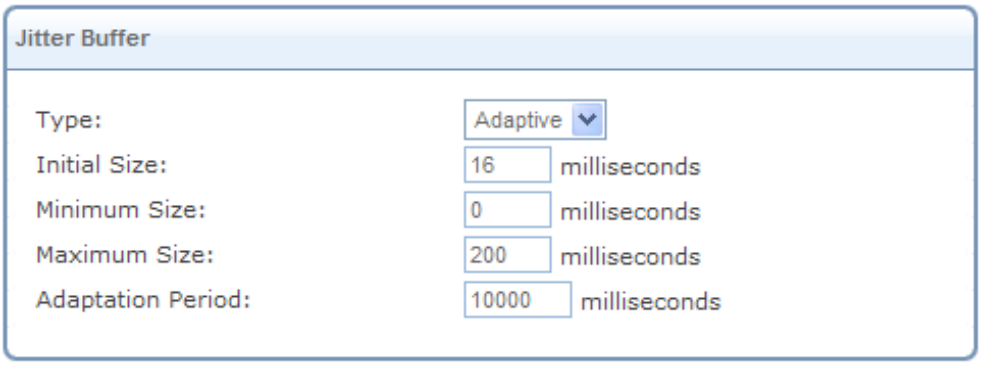

Figure 4.217 Advanced – Jitter Buffer

Type The type of the jitter buffer. Can be either adaptive or fixed. In case of adaptive jitter buffer, the following fields are visible:

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Adapt According to Determines whether the jitter buffer size depends on the packet length or on the estimated network jitter.

Scaling Factor The size of the jitter buffer is Scaling Factor multiplied by packet length or by estimated network jitter (depending on the value of the previous field).

Local Adaptation The jitter buffer modifies its size during silence gaps. This way the change in delay is not noticed by the listener. This parameter determines when to perform this adaptation. The options are:

Off Regard as silence packets only those packets that the far end has marked as such.

On Regard as silence packets both the packets that the far end detected, and the packets that were locally detected as speech gaps.

On with sample interpolation No silence is needed. The adaptation is performed gradually through interpolation, so the listener does not notice the jitter buffer change in size. Notice that for this mode, modem or fax transmission could be distorted. This feature should only be used in the case of voice transmission.

Initial Size The initial size of the jitter buffer (in milliseconds).

Maximum Size The maximum size of the jitter buffer (in milliseconds).

Minimum Size The minimum size of the jitter buffer (in milliseconds).

4.6.12.13 Changing the FXS Ports Settings

The 'FXS Ports' section in the 'Advanced' screen contains advanced electronic settings for the FXS (analog) ports, which should only be modified by an experienced administrator or technician.

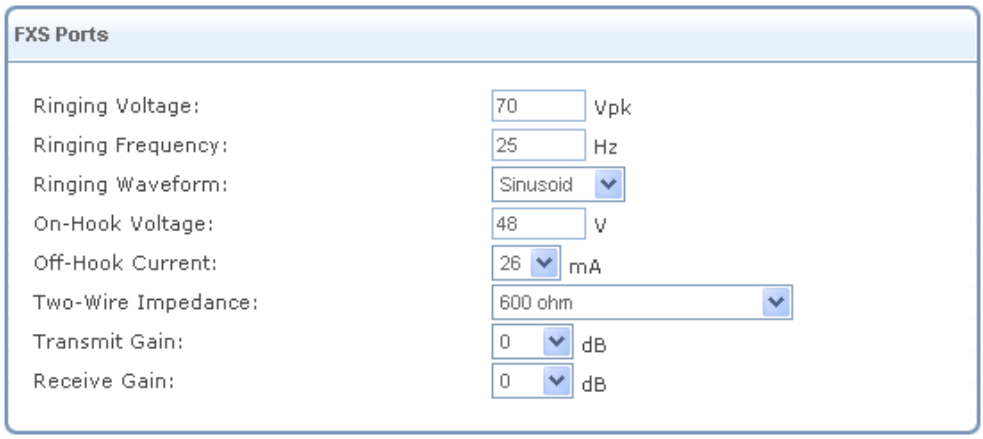

Figure 4.218 Advanced – FXS Ports

Ringing Voltage The ringing voltage in volts.

Ringing Frequency The ringing frequency in hertz.

Ringing Waveform The ringing waveform – sinusoid or trapezoid.

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On-Hook Voltage The voltage of an idle handset in volts.

Off-Hook Current Limit The current of an active handset in milli-amperes.

Two-Wire Impedance Select the voice band impedance in ohms, synthesized by the SLIC.

Transmit Gain The transmit gain in decibels.

Receive Gain The receive gain in decibels.

4.6.12.14 Enable Voice

This section allows you to enable or disable OpenRG's Voice module.

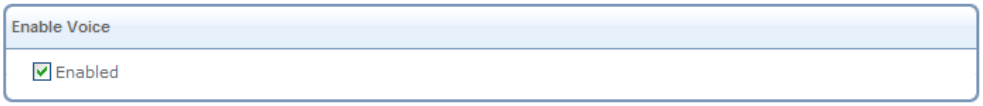

Figure 4.219 Enable Voice

Note: This feature is only available on gateways with the Asterisk-based Voice module.

To disable the Voice module, deselect the 'Enable Voice' check box, and click 'Apply'. The following message appears in all of the service's configuration screens.

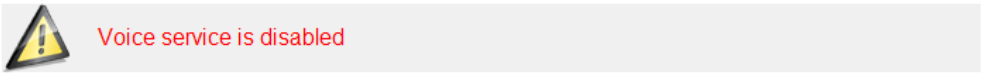

Figure 4.220 Disabled Voice Service

4.6.12.15 Configuring On Hook Caller ID Generation

The following settings determine the method by which the caller identity is generated while the handset is on-hook—the telephone is not in use.

Figure 4.221 Advanced – On Hook Caller ID Generation

Transmission Phase Select when to display the caller ID—either before or after the first ring.

Modulation Type Select the modulation type—Bell 202 or ITU V.23.

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FSK Amplitude Enter the Frequency Shift Keying amplitude.

Alerting Info Select DT-AS if alerting information is required. Otherwise, leave as "Not Required".

4.6.12.16 Configuring Off Hook Caller ID Generation

The following settings determine the method by which the caller identity is generated while the handset is off-hook—a conversation is active.

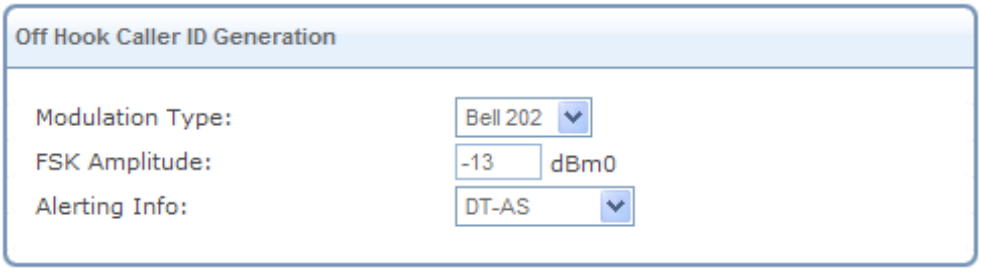

Figure 4.222 Advanced – Off Hook Caller ID Generation

Modulation Type Select the modulation type—Bell 202 or ITU V.23.

FSK Amplitude Enter the Frequency Shift Keying amplitude.

Alerting Info Select DT-AS if alerting information is required. Otherwise, leave as "Not Required".

4.6.12.17 Setting the Flash Button Timeout

The PBX distinguishes between pressing the hook and "Flash" button by the length of time that the Flash button is pressed. If it is pressed for longer than this timeframe, pressing Flash becomes equivalent to pressing the hook (phone hang-up).

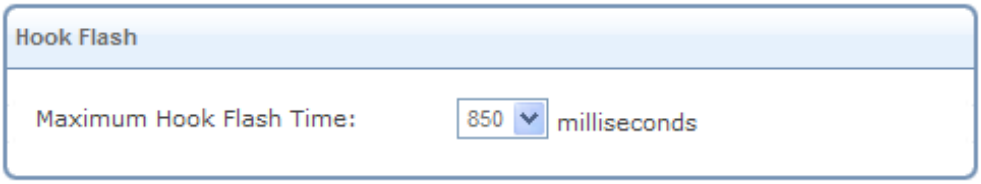

Figure 4.223 Advanced – Hook Flash

Maximum Hook Flash Time Select the maximum timeframe (between 250 and 850 milliseconds) after which pressing the Flash button hangs up the call.

4.7 Managing Your Shared Storage

OpenRG can operate as a disk manager for storage devices connected via USB. Your home-network's LAN devices can share this storage device as a mapped network drive, and exchange information without directly accessing each other.

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4.7.1 Managing Your File Server

OpenRG provides a file server utility, allowing you to perform various tasks on your files, such as manage file server shares and define access control lists. When a mass storage device is connected to the gateway, all disk partitions are automatically shared by default.

Access the file server settings by clicking the 'Storage' menu item under the 'Services' tab. The 'File Server' screen appears.

Figure 4.224 File Server

Enabled Select or deselect this check box to enable or disable this feature.

NetBIOS Workgroup OpenRG's workgroup name that will be displayed in the Windows network map of LAN hosts. All computers connected to OpenRG's network will appear in this workgroup.

Automatically Share All Partitions A partitioned storage device connected to OpenRG is automatically displayed and shared by all LAN computers. This feature is enabled by default.

Allow Guest Access From the drop-down menu, select a permission level, according to which the LAN users will access the share:

Read/Write Every LAN user can read and write the shared files without authentication.

Read Only Every LAN user can only read the shared files.

Disabled LAN users must authenticate themselves, in order to access the share. They will be able to use the share according to their permissions defined in OpenRG's 'User Settings' screen.

File Server Shares Define file shares on your disk partitions, as depicted in the following sections.

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4.7.1.1 Sharing Specific Partitions with Microsoft File Sharing

By default, all partitions are automatically displayed shared among all users. Figure 4.224 depicts such a scenario, where share entries appear in the 'File Server Shares' section as soon as a partitioned and formatted storage device is connected to the gateway. However, if you only wish to share specific partitions, you can disable automatic file sharing and manually define file shares using the 'Microsoft File Sharing Protocol'. Note that this protocol requires associating specific users with the shares.

To share a specific partition only, perform the following sequence. First, enable Microsoft File Sharing for users you would like to have access to the share:

1. Click the 'Users' menu item under the 'System' tab. The 'Users' screen appears.

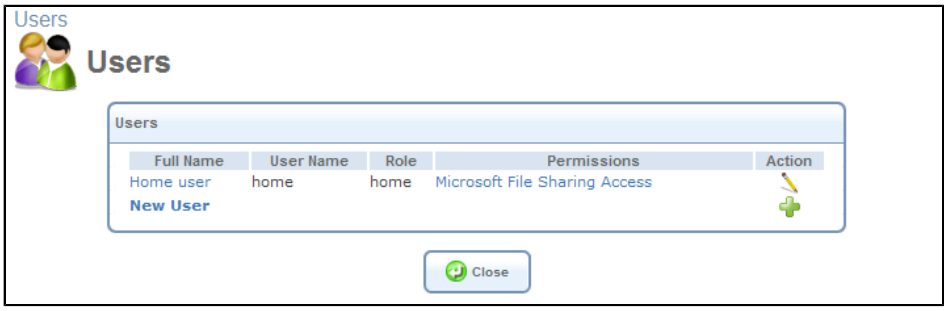

Figure 4.225 Users

2. Click the name of the user for whom you wish to enable file sharing.

3. In the 'User Settings' screen that appears, check the "Microsoft File and Printer Sharing Access" check box in the 'Permissions' section.

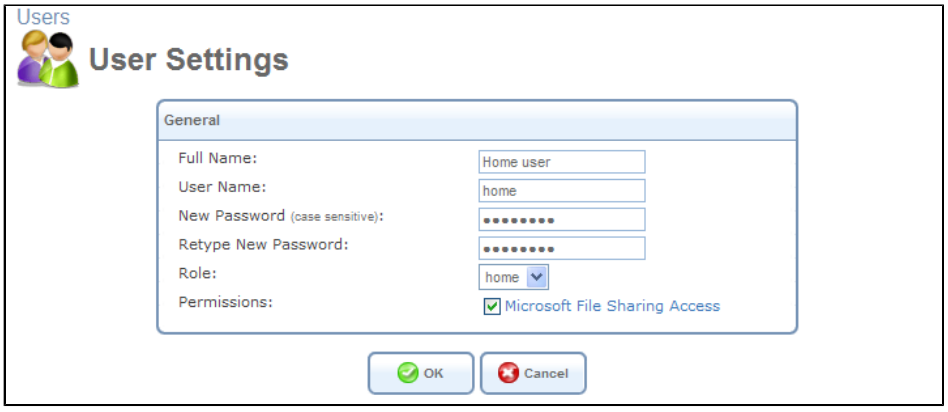

Figure 4.226 User Settings

4. Click 'OK' to save the settings.

Next, define the specific file share:

1. In the 'File Server' screen (see Figure 4.224), deselect the 'Automatically Share All Partitions' option and click 'Apply'. The list of all automatically shared partitions disappears.

2. Click the 'New Entry' link. In the 'File Server Share Settings' that appears:

   a. Enter a name for the share in the 'Name' field.

   > Note: The default name "share" can be changed to another one. The share's name is not case sensitive. Even if entered in upper-case letters, the name will be displayed in lower case, after saving the setting.

   b. Enter a valid partition path (e.g. A, B/my_documents) in the 'Path' field.

   > Note: If a drive's sub directory does not exist yet, you will have to create it as soon as the share is defined and accessible.

   c. You may add a comment in the 'Comment' field.

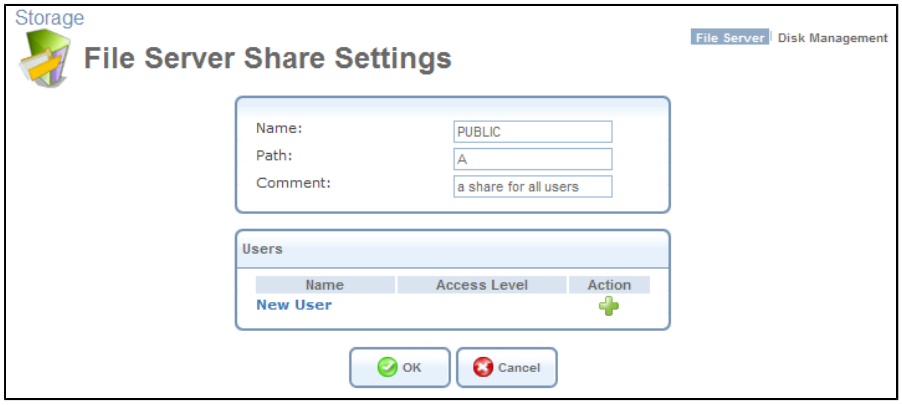

Figure 4.227 File Server Share Settings

   d. In the 'Users' section, click the 'New User' link to allow a user to use the share.

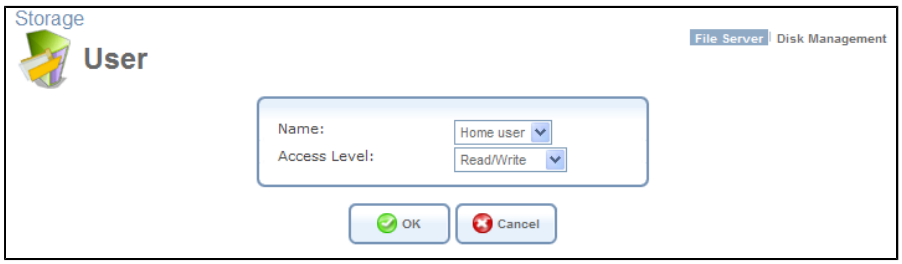

Figure 4.228 User

   e. Select the user and the allowed access level in the drop-down menus, and click 'OK'.

3. Click 'OK' to save the settings. The 'File Server' screen reappears, displaying the share in the 'File Server Shares' section.

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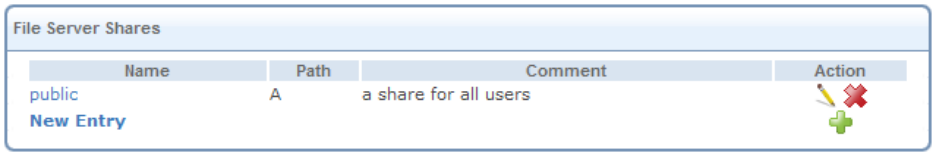

Figure 4.229 File Server Shares Section

However, note that access to a file share is different for FAT32, NTFS, and EXT2/3 formatted partitions. FAT32 has no restrictions—any user can access any share for both reading and writing. However, the data stored on NTFS partitions is only readable (unless OpenRG is based on the Conexant Solos or Freescale platforms).

In addition, shares defined on EXT2/3 partitions are only readable to non-administrator users (even with writing permissions), with the following exceptions:

- The user will be able to write to the share's root directory (e.g. A\, my_share\).
- The user will be able to write to his/her home directory, if such had been created for that user, by enabling the 'Enable User Home Directory' option in the 'User Settings' screen (see Figure 4.226).

Moreover, to create new directories that will be writable for users, you must be logged in as a user, not an administrator. Any directories created by an administrator will only be writable to the administrator.

To access the new share, you must be logged in with a user associated with share (in this example, user 'home'). Perform the following:

1. Click the share's link under the 'Name' column in the 'File Server Shares' section (see Figure 4.229).

   Note: If the share is not available, for example if the disk has been removed, the link will not be clickable and appear as plain text.

   A Windows login dialog box appears.

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Figure 4.230 Login Dialog

2. Enter your WBM username and password to login. The share opens in a new window.

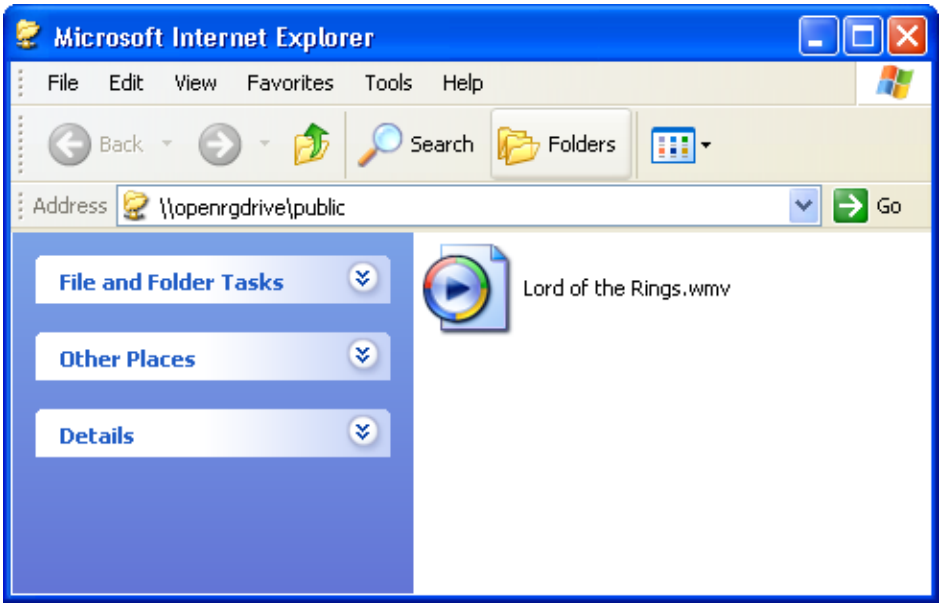

Figure 4.231 File Share

Once logged into a share, Windows remembers your username and password, and automatically re-logins with the same user. To logout and re-login with a different user (for example, to switch between an administrator and a user), logout and re-login to Windows.

Users with appropriate permissions can access file shares from any PC on the LAN using the following standard methods:

- From OpenRG's Web-based management as described above.
- Browsing to the share itself by simply typing its path (for example, openrg\A) in a browser address line or in the command line.
- Mapping the share using Window's 'Map Network Drive' utility.

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All of these methods require an initial username and password login, as described above. The share content will be displayed in a new window. If the share is the partition configured to serve as the system storage area, it will contain automatically-generated system folders. Otherwise, it will either be empty or contain pre-loaded files.

4.7.1.2 Viewing and Modifying Access Control Lists

The Windows operating system boasts an extensive file permission scheme. When you right-click a file and choose Properties, you can see under the Security tab (see Figure 4.232) that file permissions can be defined for any number of users and groups. Each user and group may be allowed or denied several levels of access, ranging from Full Control to Read only.

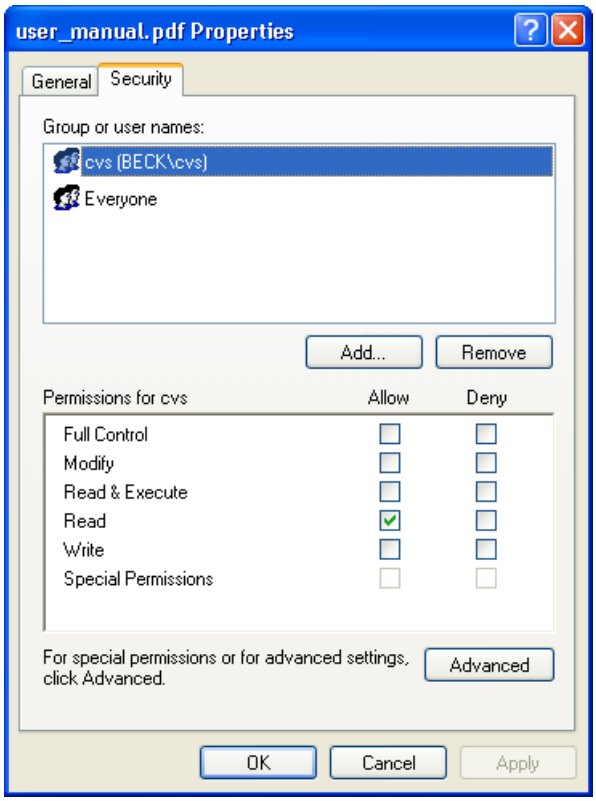

Figure 4.232 File Properties

Linux, on the other hand, has a very limited file permissions scheme, offering the basic Read (r), Write (w) and Execute (x) permissions to the file owner and his group only. Access Control Lists (ACLs) are an extension of the common Linux permission scheme. ACLs allow granting the aforementioned permissions not only to the file owner and his group, but to any number of users and groups. The need for ACLs in OpenRG is mainly to support permissions defined by a Windows client connected to the file server. This connection is done via the 'Microsoft File and Printer Sharing Protocol', which is supported on OpenRG and allows interoperability between Linux/Unix servers and Windows-based clients. The basic user and group file permissions in Windows are: Full control, Modify, Read and Execute, Read, and Write. Each permission can be allowed or denied. Linux supports Read, Write and Execute only, and does not support the Allow/Deny mechanism. When you modify a file's permissions on a Windows client, OpenRG uses a "best effort" algorithm to translate the ACLs to Linux r/w/x bits, making the file compatible with Linux clients.

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To view a file's access control list on a Windows client connected to OpenRG's file server, perform the following:

1. Click the file share link in the 'File Server Shares' section (see Figure 4.229) of the 'File Server' screen to open the file share (login with a valid user for the share if a login prompt appears).

2. Create a file on the share.

3. Right-click the file and choose "Properties".

4. Click the Security tab to view the file ACLs (see Figure 4.232). If you do not have a Security tab:

    1. Open "My Computer" and choose Tools and then Folder Options.

    2. Under the View tab, uncheck the "Use simple file sharing (Recommended)" check box.

Under the Security tab you can view the permissions of the file owner, the owner's group and the group "Everyone", for all other users. If you have more users (or groups) defined on OpenRG, you can add them to the file's ACL and grant them permissions. To modify a file's access control list, perform the following:

1. Click the 'Add' button in the Security tab window to view the users and groups list.

2. In the 'Select Users or Groups' window that appears (see Figure 4.233), press the 'Advanced' button.

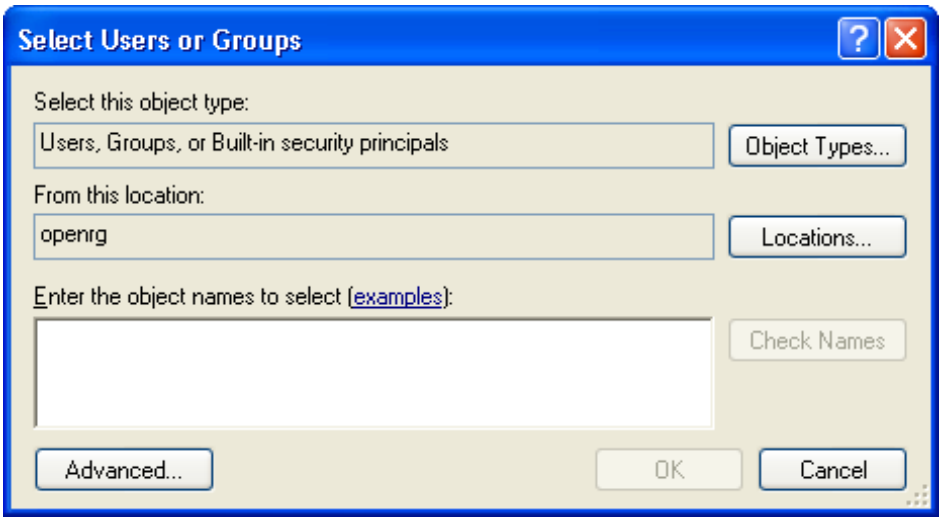

Figure 4.233 Select Users or Groups

3. In the advanced window (see Figure 4.234) press the 'Find Now' button.

4. A login prompt will appear. Log in with the same share user [1]. A list of both OpenRG users and system default users will be displayed.

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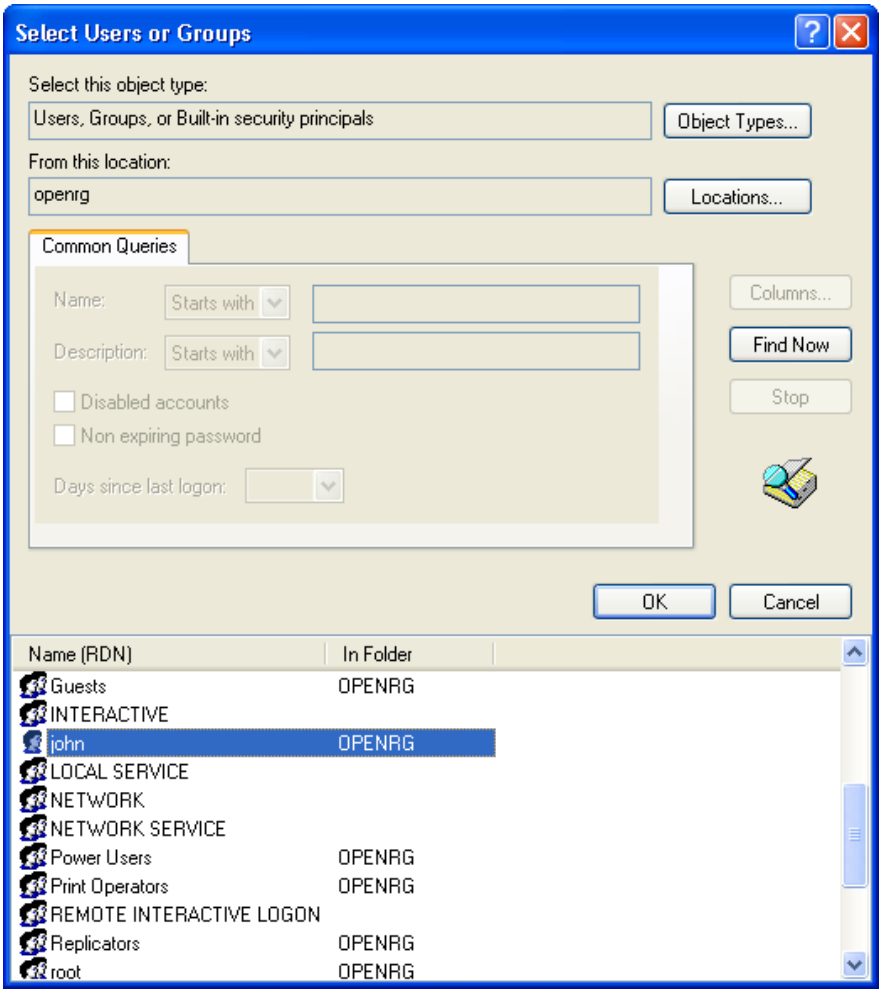

Figure 4.234 Users or Groups List

5. Select an OpenRG user from the list and click 'OK'. Click 'OK' again in the initial 'Select Users or Groups' window to save the settings. The selected user will be added to the groups and users list on the Security tab, with the default ACLs.

6. Check or uncheck the different permissions to allow or deny the user of the permissions.

7. Click 'OK' to save the settings.

In the same manner, you can remove a user or a group using the 'Remove' button in the Security window.

4.7.1.3 Using the File Server with Mac

In order to connect to OpenRG's file server with a Mac computer, perform the following:

1. On your Mac computer connected to OpenRG, click "Connect to Server" from the "Go" menu. The 'Connect to Server' screen appears.

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Figure 4.235 Connect to Server

2. In the server address field, enter **smb://192.168.1.1** , and click the 'Connect' button. A new window appears, displaying the available file shares.

Figure 4.236 Connect to Server

3. Select the share to which you would like to connect. If prompted, enter a valid username and password, and click 'OK'. When a connection is established, the share content appears.

Figure 4.237 Connect to Server

4.7.2 Managing Your Disks

The 'Storage' menu item provides access to the 'Disk Management' screen, which enables you to view and manage your storage devices.

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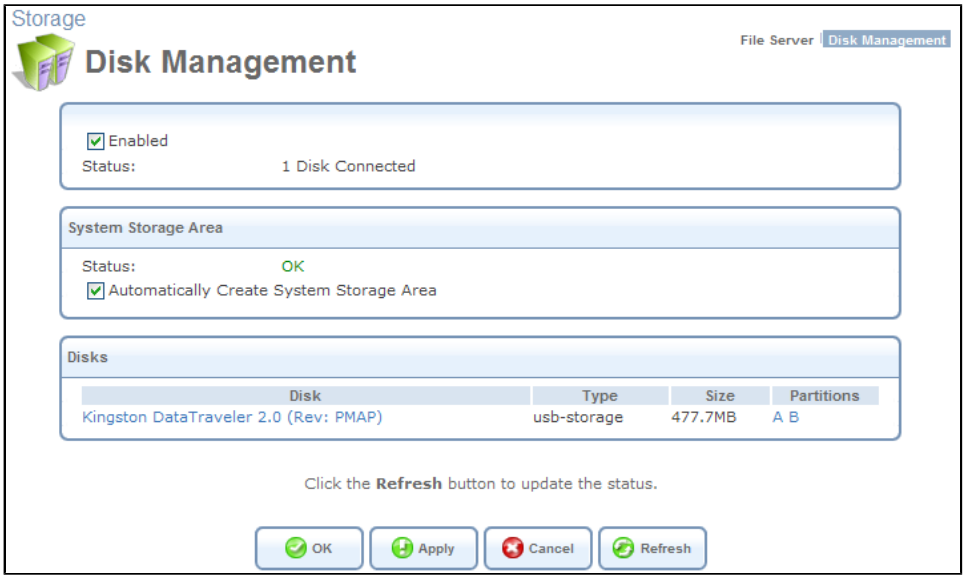

Figure 4.238 Disk Management

Enabled Select or deselect this check box to enable or disable this feature.

NetBIOS Workgroup OpenRG's workgroup name that will be displayed in the Windows network map of LAN hosts. All computers connected to OpenRG's network will appear in this workgroup.

System Storage Area OpenRG automatically defines a specific location on the storage device for storing data used by its various services. This setting is valid until the storage device is disconnected. When reconnected, OpenRG may select another partition for this purpose.

Disks This section provides details about the attached storage device. Click the name of the disk. The 'Disk Information' screen appears, providing all available information regarding the disk and its partitions.

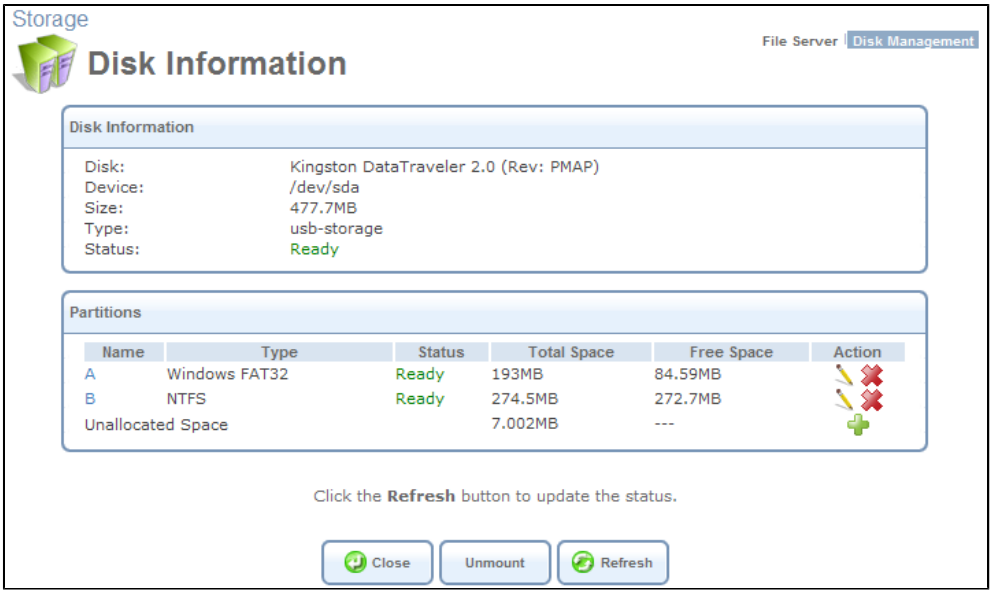

Figure 4.239 Disk Information

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4.7.2.1 Managing Disk Partitions

A disk partition can be formatted, checked, or deleted. The following sections describe each of these operations.

Warning: When applying administrative changes to storage devices, services using these devices are stopped.

4.7.2.1.1 Adding and Formatting a Partition

In order to be used, a mass storage device must first be partitioned and formatted. However, partitioning can only be performed on unallocated disk space. If your device is already partitioned, you may not be able to add a partition, unless unallocated space is available.

To add a Windows formatted partition, perform the following:

1. Click the 'Storage' menu item under the 'Services' tab. The 'Disk Management' screen appears.

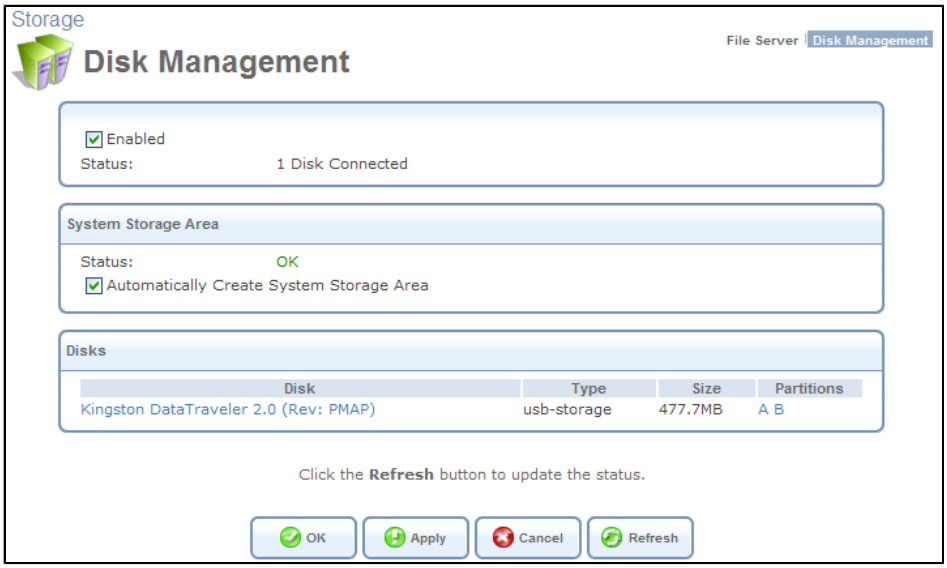

Figure 4.240 Disk Management

2. In the 'Disks' section, displaying your connected storage devices, click the disk's link. The 'Disk Information' screen appears.

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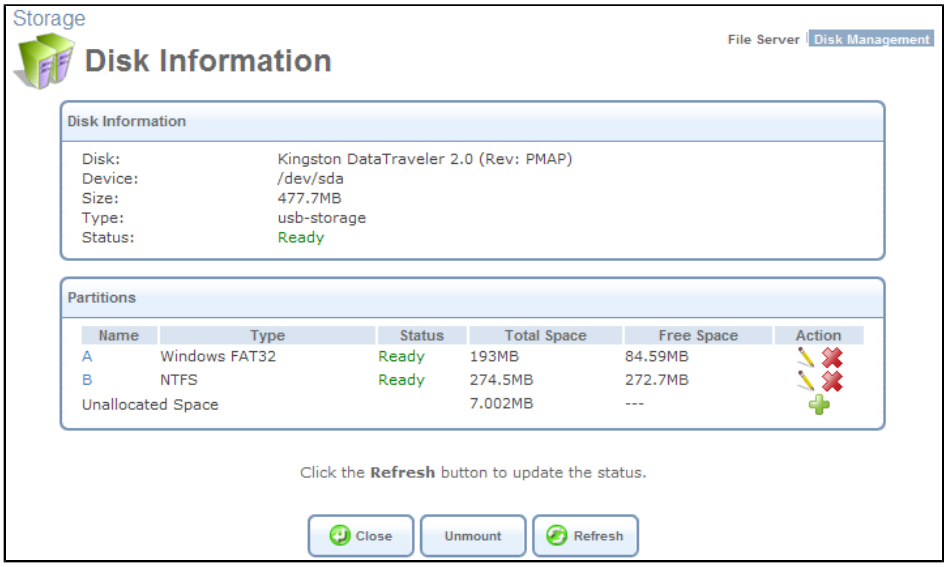

Figure 4.241 Disk Information

3. In the 'Partitions' section, click the action icon . The 'Partition Type' screen appears.

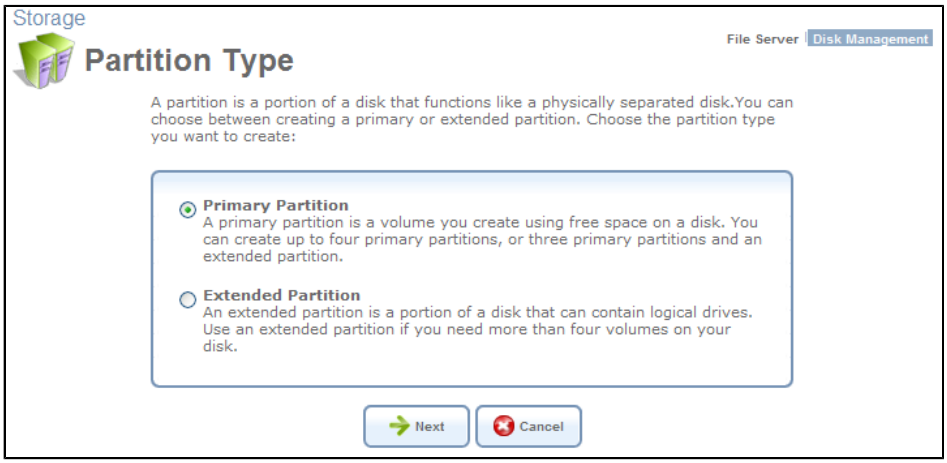
Storage
Partition Type
File Server
Disk Management
A partition is a portion of a disk that functions like a physically separated disk.You can choose between creating a primary or extended partition. Choose the partition type you want to create:
Primary Partition
A primary partition is a volume you create using free space on a disk. You can create up to four primary partitions, or three primary partitions and an extended partition.
Extended Partition
An extended partition is a portion of a disk that can contain logical drives. Use an extended partition if you need more than four volumes on your disk.
Next
Cancel

Figure 4.242 Partition Type

4. Select 'Primary Partition', and click 'Next'. The 'Partition Size' screen appears.

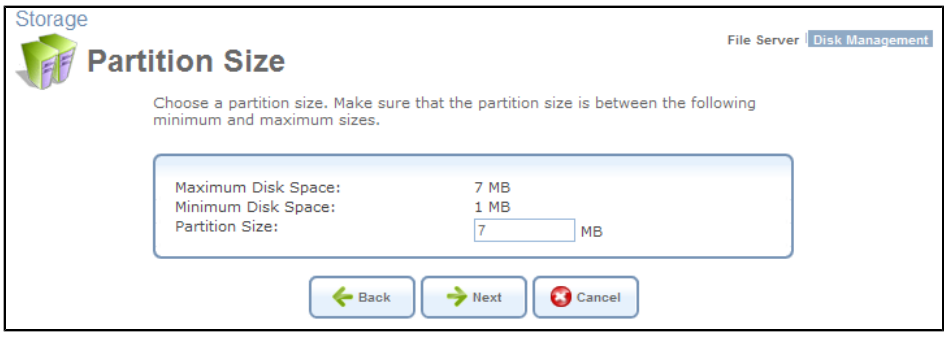

Figure 4.243 Partition Size

5. Enter a volume for the new partition (in mega bytes) and click 'Next'. The 'Partition Format' screen appears.

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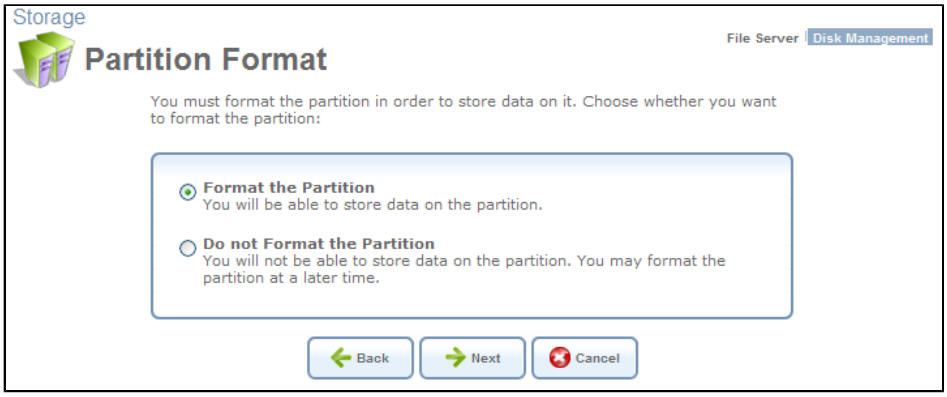
Storage
Partition Format
File Server
Disk Management
You must format the partition in order to store data on it. Choose whether you want to format the partition:
Format the Partition
You will be able to store data on the partition.
Do not Format the Partition
You will not be able to store data on the partition. You may format the partition at a later time.
Back
Next
Cancel

Figure 4.244 Partition Format

6. Select 'Format the Partition', and click 'Next'. The 'Partition File System' screen appears.

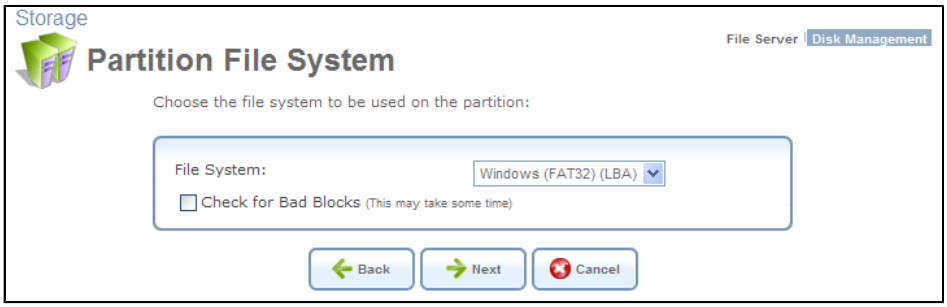

Figure 4.245 Partition File System

7. Select 'Windows (FAT32) (LBA)' as the file system for the partition and click 'Next'. The 'Partition Summary' screen appears.

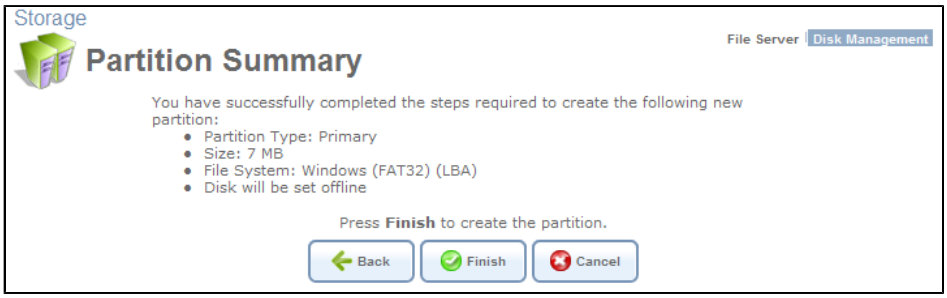

Figure 4.246 Partition Summary

8. Click 'Finish' to create the new partition. The 'Disk Information' screen reappears, refreshing as the partition formatting progresses, until the status changes to 'Ready'.

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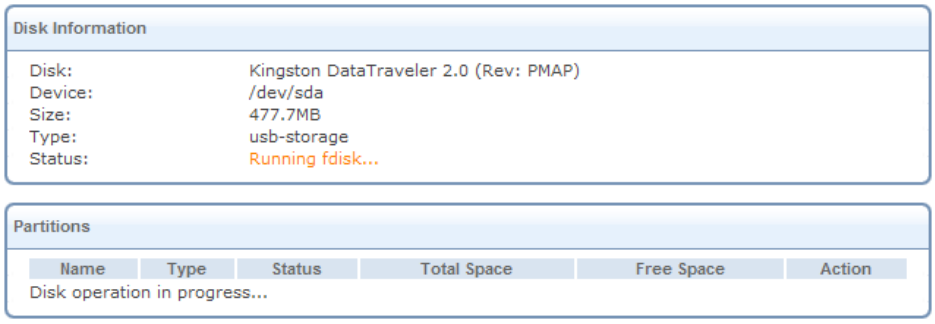

Figure 4.247 Partition Formatting in Progress

The new partition path names are designated as "A", "B", etc.

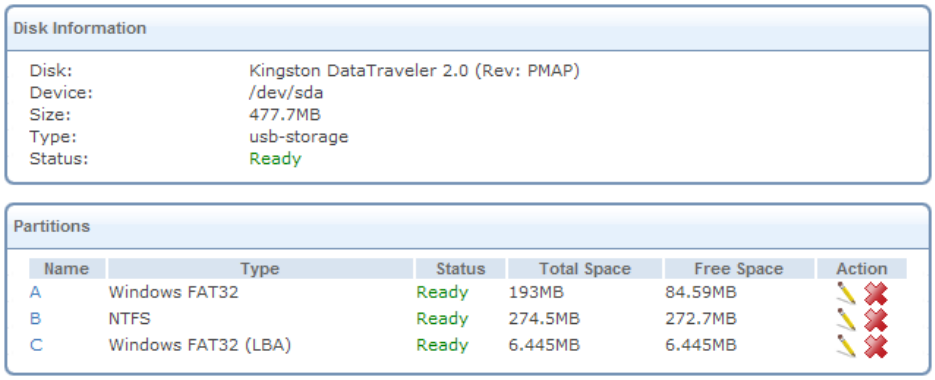

Figure 4.248 Formatting Complete – Partition Ready

To learn about additional operations you can perform on your storage device, refer to the 'Shared Storage' section of the OpenRG Administrator Manual.

4.7.2.1.2 Checking a Partition

Periodically, you should check the disk's partitions for the presence of bad sectors, to maintain the disk's health and prevent data loss.

To check a partition:

1. In the 'Disks' section of the 'Disk Management' screen, click the disk's link. The 'Disk Information' screen appears.

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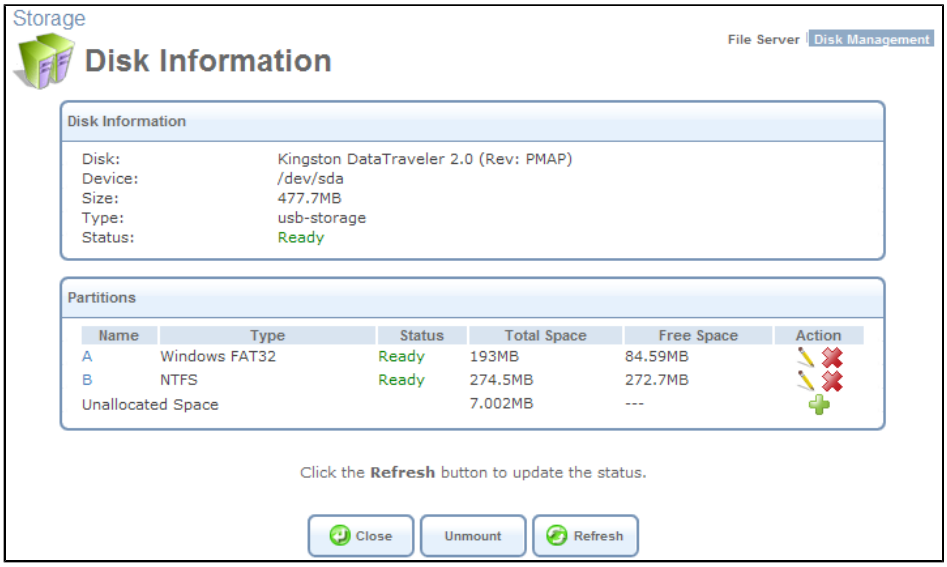

Figure 4.249 Disk Information

2. In the 'Partitions' section, click the action icon of the partition you would like to check. The 'Partition Properties' screen appears.

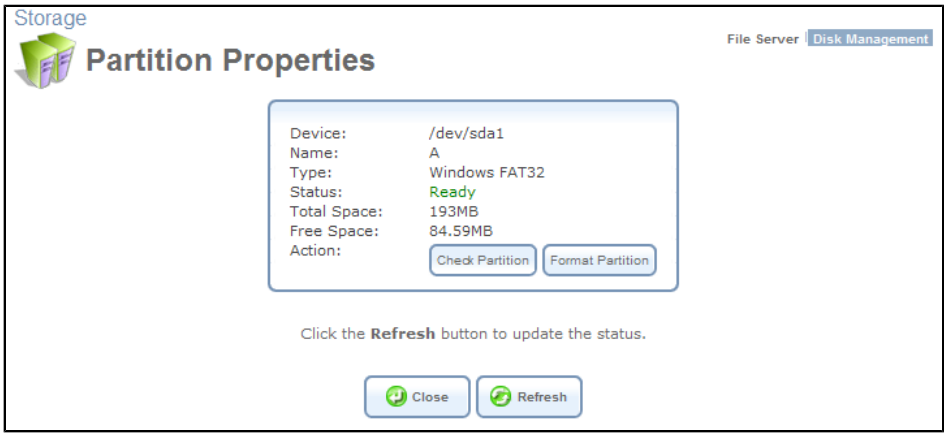

Figure 4.250 Partition Properties

3. Click the 'Check Partition' button. The 'Partition Check' screen appears.

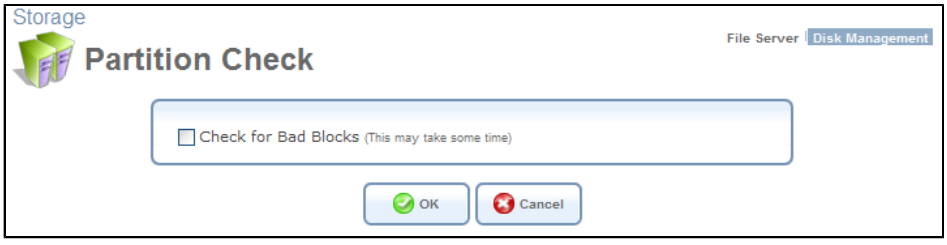

Figure 4.251 Partition Check

This screen enables you to check a partition for presence of bad blocks prior to the regular file system checkup. To do so, select the 'Check for Bad Blocks' check box.

4. Click 'Next'. A warning screen appears, alerting you that the partition will be set to offline.

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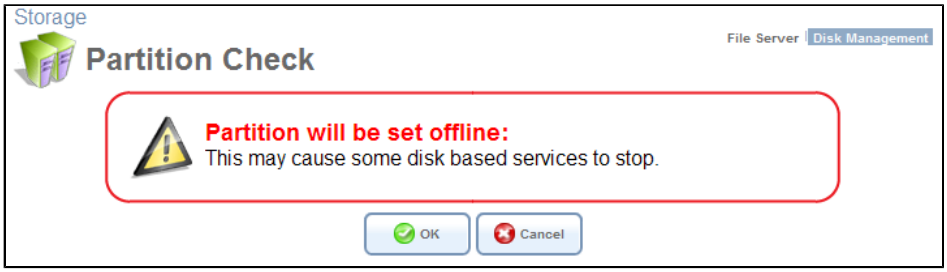

Figure 4.252 Offline Partition Warning

5. Click 'OK' to check the partition. The screen refreshes as the partition checking progresses.

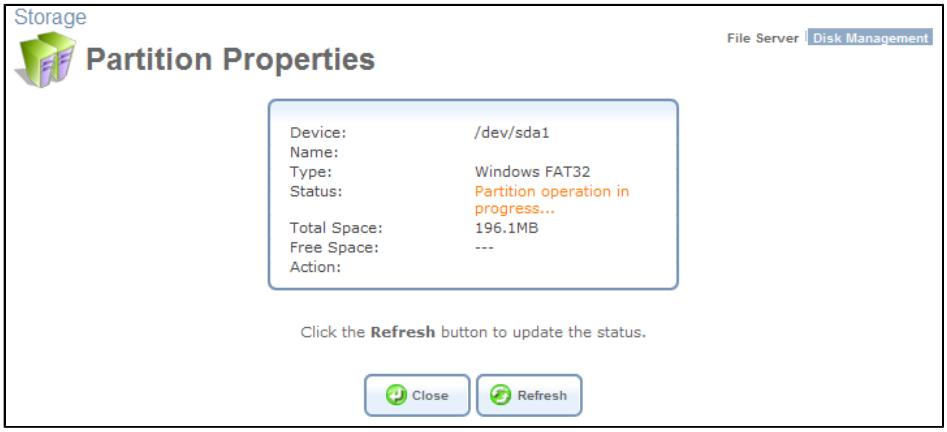

Figure 4.253 Partition Checking in Progress

When the check is complete, the status changes to 'Ready'.

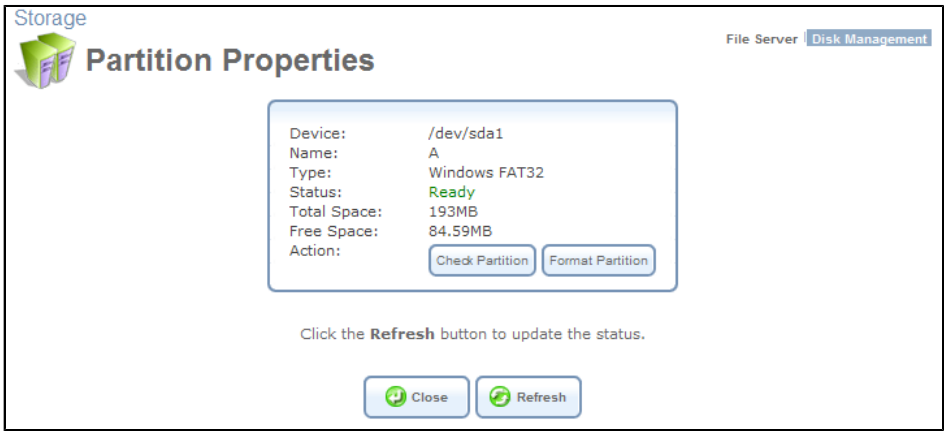

Figure 4.254 Checking Complete – Partition Ready

4.7.2.1.3 Reformatting a Partition

In addition to formatting a newly created partition, you can reformat an existing partition with either EXT2, EXT3, or FAT32 file systems. Unless your gateway is based on the Intel IXP425 or Infineon platform, a partition can also be formatted with NTFS, allowing both *Read* and *Write* access. OpenRG running on the Intel IXP425 or Infineon platforms identifies a storage device formatted with NTFS, but only allows *Read* access to it.

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Note: For security reasons, it is recommended to format disk partitions with the EXT2 or EXT3 file system.

To reformat a partition:

1. In the 'Disks' section of the 'Disk Management' screen, click the disk's link. The 'Disk Information' screen appears.

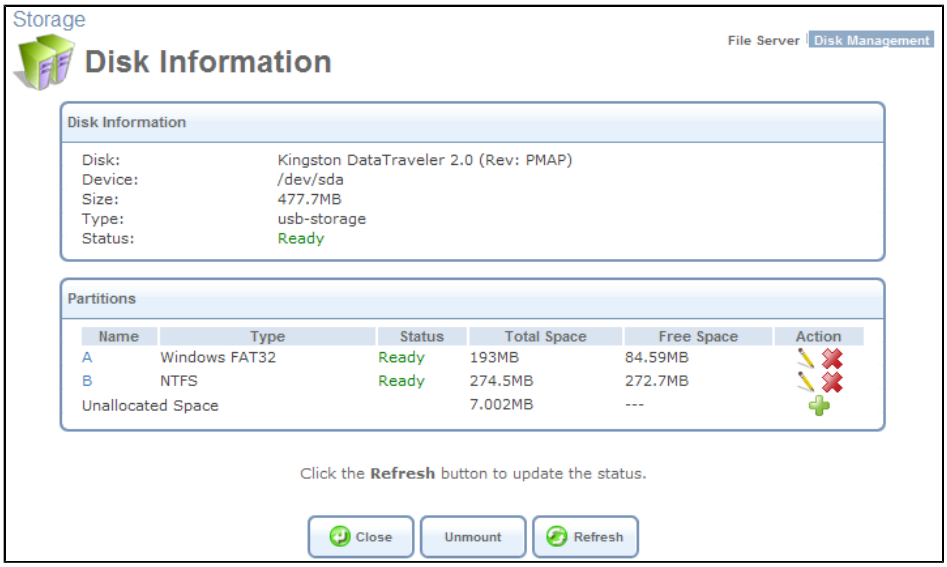

Figure 4.255 Disk Information

2. In the 'Partitions' section, click the action icon of the partition you would like to edit. The 'Partition Properties' screen appears.

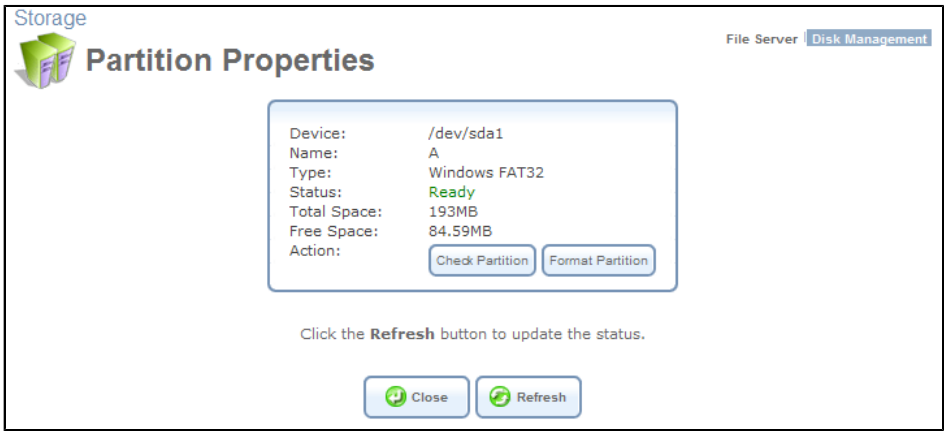

Figure 4.256 Partition Properties

3. Click the 'Format Partition' button. The 'Partition Format' screen appears.

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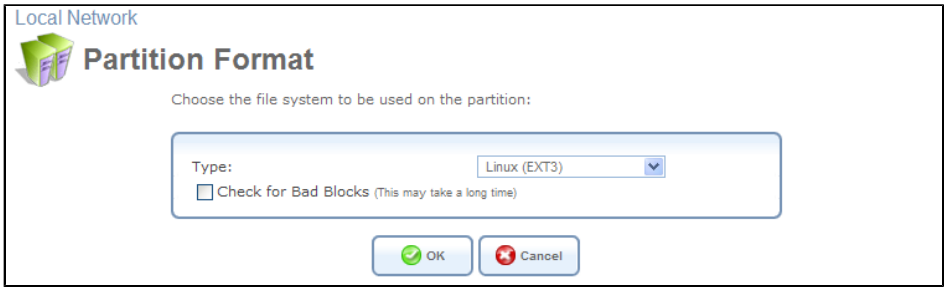

Figure 4.257 Partition Format

Note: You can also instruct OpenRG to check the disk for bad blocks prior to formatting it, by selecting the corresponding check box. Only the disk space consisting of healthy blocks will be formatted. Bad blocks will be ignored.

4. Select a file system for the partition and click 'Next'. A warning screen appears, alerting you that all the data on the partition will be lost.

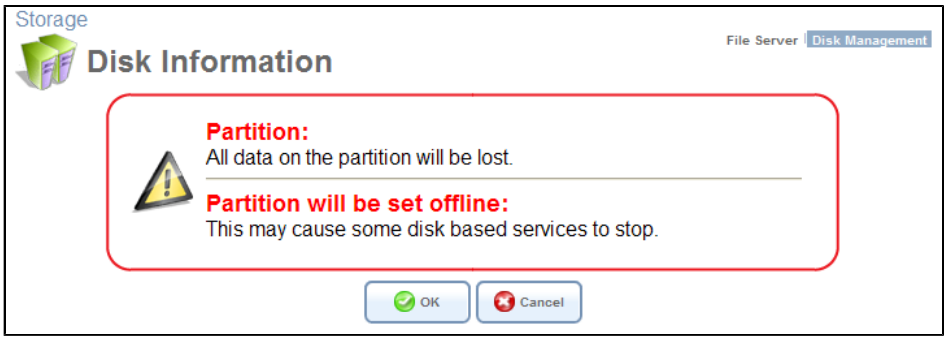

Figure 4.258 Lost Data Warning

5. Click 'OK' to format the partition. The screen refreshes as the partition formatting progresses.

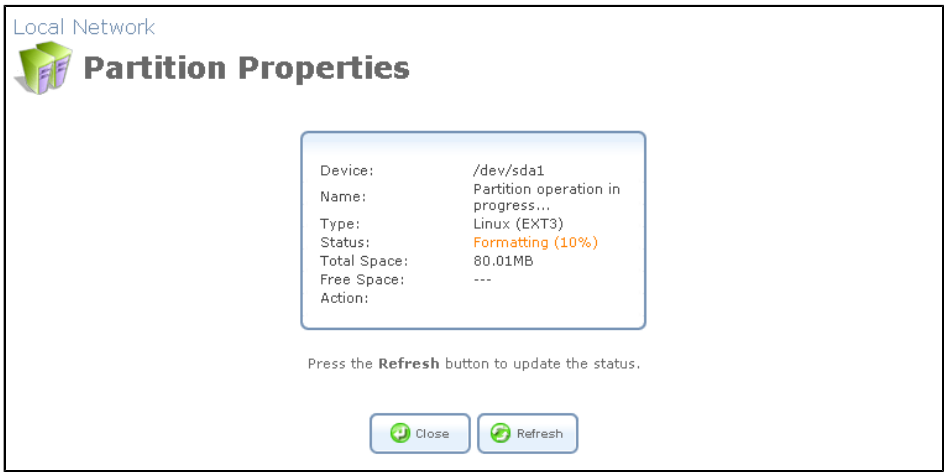

Figure 4.259 Partition Formatting in Progress

When the format is complete, the status changes to 'Ready'.

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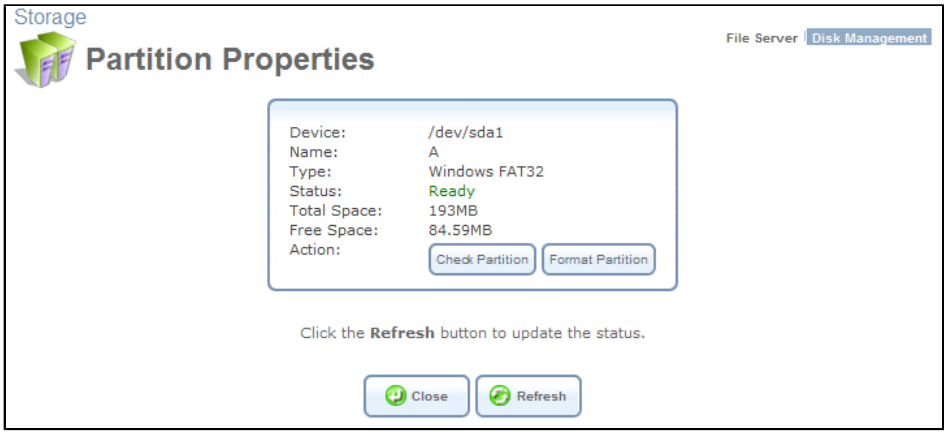

Figure 4.260 Formatting Complete – Partition Ready

4.7.2.1.4 Deleting a Partition

If you would like to delete a partition on your storage device, perform the following:

1. In the 'Disks' section of the 'Disk Management' screen, click the disk's link. The 'Disk Information' screen appears.

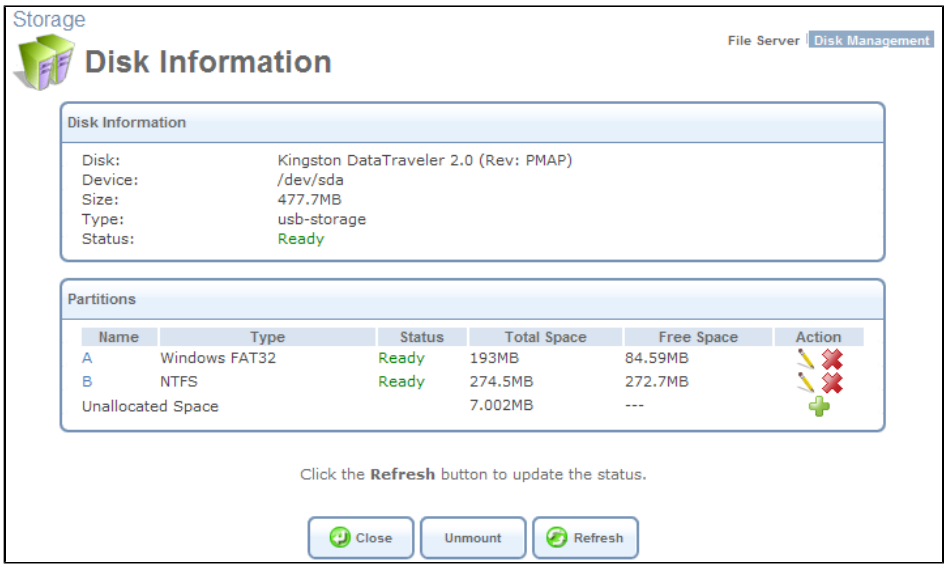

Figure 4.261 Disk Information

2. In the 'Partitions' section, click the action icon of the partition you would like to delete. A warning screen appears, alerting you that all the data on the partition will be lost.

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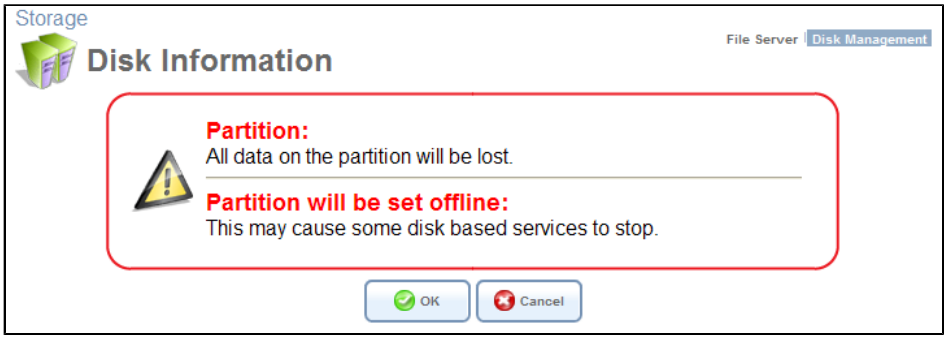

Figure 4.262 Lost Data Warning

3. Click 'OK' to delete the partition.

4.7.2.2 Changing the System Storage Area Location

OpenRG uses a specific location on a storage device for storing data used by its various services. The following services use the system storage area:

- Printer spool and drivers
- Mail server spool
- Backup of OpenRG's configuration file (rg_conf)
- PBX-related audio files for voice mail, auto attendants and music on-hold
- FTP server
- Mail boxes information
- Users' home directories
- Web server content

If you would like to set a specific partition as the location for the system storage area, perform the following:

1. Deselect the 'Automatically Create System Storage Area' check box. The screen refreshes displaying the 'System Storage Area' field (containig the auto-selected partition).

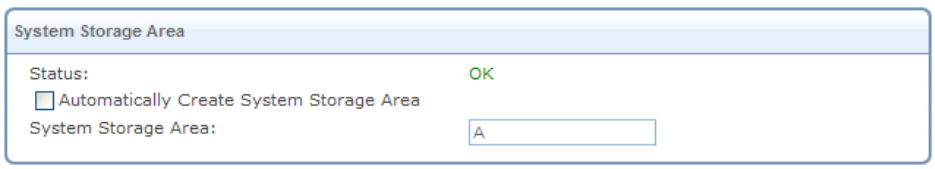

Figure 4.263 Manually Defined System Storage Area

2. Enter the letter of the partition to which you would like to set the system storage area.

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3. Click 'OK' to save the settings.

If you wish to view the system directories, verify that the system storage area is shared (refer to Section 4.7.1.1). Then, browse to `\\openrgdrive\<PARTITION LETTER>` (use Windows Explorer if you are using a browser other than Internet Explorer).

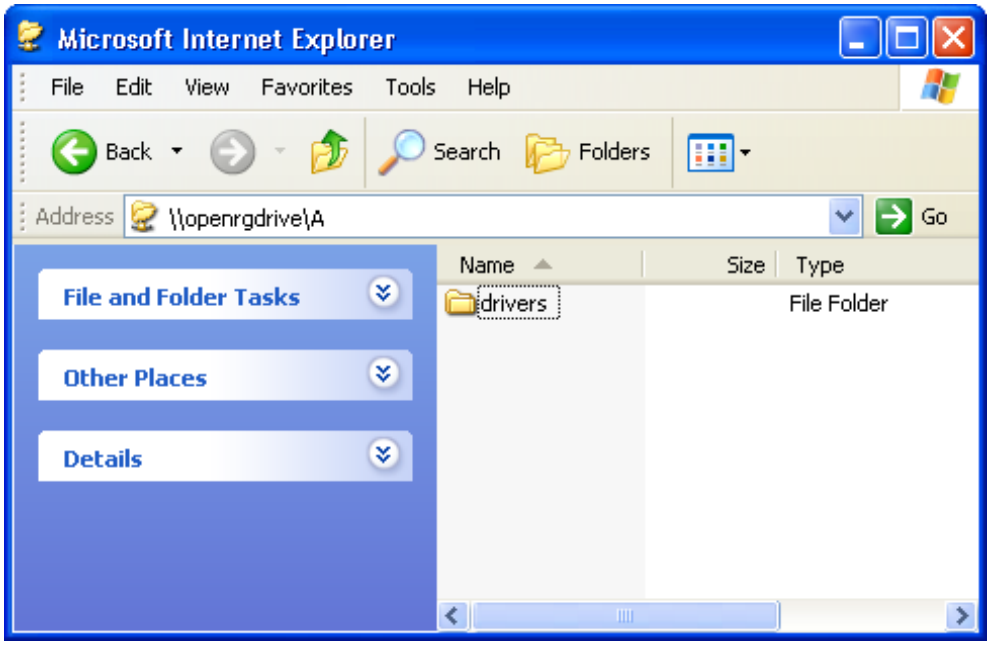

Figure 4.264 System Storage Area Directories

Note: Data cannot be written to partitions formatted with NTFS, unless OpenRG is based on the Conexant Solos, Mindspeed Malindi2 or Freescale platform. Consequently, if you define an NTFS partition as the system storage area, the services mentioned earlier will not operate on OpenRG, displaying a warning message.

4.8 Accessing Your Network Using a Domain Name

OpenRG's Dynamic DNS (DDNS) service enables you to define a unique domain name for your gateway's Internet connection, thereby allowing you to access the gateway or your home network's services just by pointing the browser to this name. When using this feature, you will not need to check and remember your gateway's Internet IP address, which may change in case of a disconnection from the ISP's network.

4.8.1 Opening a Dynamic DNS Account

In order to use the DDNS feature, you must first obtain a DDNS account. OpenRG provides a list of DDNS servers on which you may create such an account. To view this list, perform the following:

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1. Access this feature either from the 'Advanced' tab under the 'Services' screen, or by clicking its icon in the 'Advanced' screen. The 'Dynamic DNS' connections screen appears.

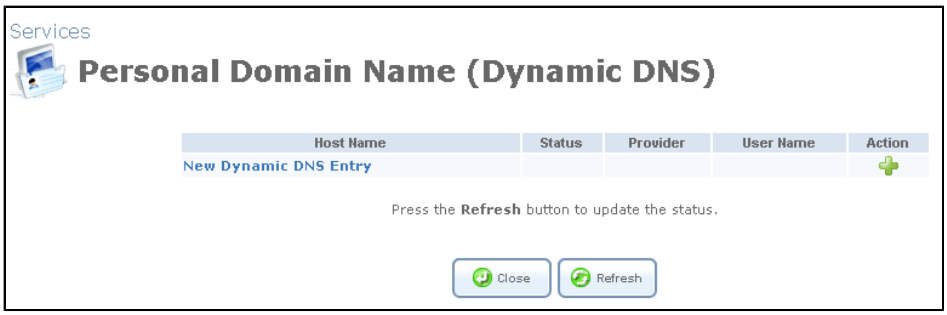

Figure 4.265 Personal Domain Name (Dynamic DNS)

2. Click the 'New Dynamic DNS Entry' link to add a new DDNS entry. The following screen appears.

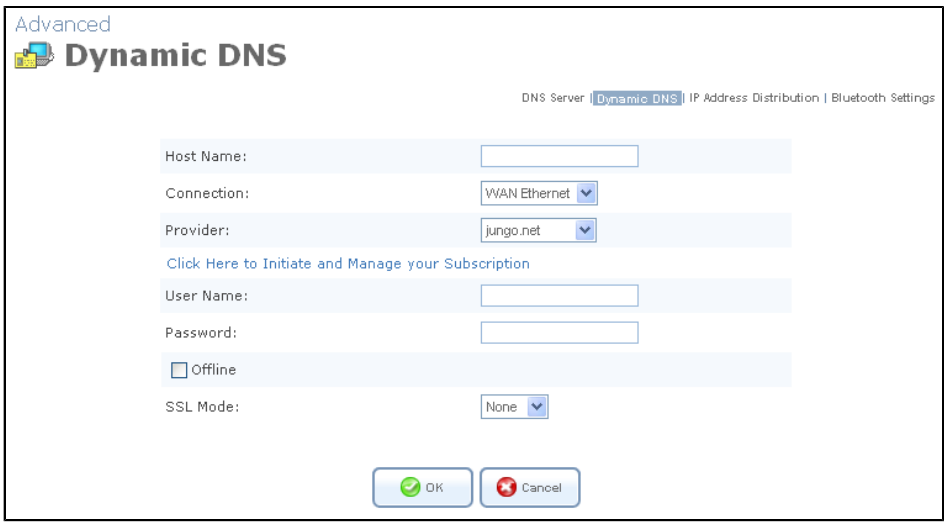

Figure 4.266 Dynamic DNS Entry

3. Specify the DDNS parameters:

Host Name Enter your full DDNS domain name.

Connection You can couple the DDNS service with your WAN Ethernet connection.

Provider Select your DDNS service provider. The screen will refresh, displaying the parameters required by each provider. The provider depicted herein is `dyndns.org`, which includes all available parameters.

Click Here to Initiate and Manage your Subscription Clicking this link will open the selected provider's account creation Web page. For example, when `dyndns.org` is selected, the following page will open: http://www.dyndns.com/account/.

User Name Enter your DDNS user name.

Password Enter your DDNS password.

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Wildcard Select this check-box to enable use of special links such as `http://www.<your host>.dyndns.com`.

Mail Exchanger Enter your mail exchange server address, to redirect all e-mails arriving at your DDNS address to your mail server.

Backup MX Select this check box to designate the mail exchange server to be a backup server.

Offline If you wish to temporarily take your site offline (prevent traffic from reaching your DDNS domain name), select this check box to enable redirection of DNS requests to an alternative URL, predefined in your DDNS account. The availability of this feature depends on your account's level and type of service.

SSL Mode With OpenRG versions that support Secure Socket Layer (SSL), secured DDNS services are accessed using HTTPS. Upon connection, OpenRG validates the DDNS server's certificate. Use this entry to choose the certificate's validation method.

None Do not validate the server's certificate.

Chain Validate the entire certificate chain. When selecting this option, the screen will refresh (see Figure 4.267), displaying an additional drop-down menu for selecting whether to validate the certificate's expiration time. Choose 'Ignore' or 'Check' respectively. If the certificate has expired, the connection will terminate immediately.

Figure 4.267 SSL Mode

Direct Ensure that the server's certificate is directly signed by the root certificate. This option also provides the 'Validate Time' drop-down menu for validation of the certificate's expiration time, as described above.

4.9 Configuring Your Gateway's IP Address Distribution

Your gateway's Dynamic Host Configuration Protocol (DHCP) server makes it possible to easily add computers that are configured as DHCP clients to the home network. It provides a mechanism for allocating IP addresses and delivering network configuration parameters to such hosts. OpenRG's default DHCP server is the LAN bridge. A client (host) sends out a broadcast message on the LAN requesting an IP address for itself. The DHCP server then checks its list of available addresses and leases a local IP address to the host for a specific period of time and simultaneously designates this IP address as `taken'. At this point the host is configured with an IP address for the duration of the lease.

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The host can choose to renew an expiring lease or let it expire. If it chooses to renew a lease then it will also receive current information about network services, as it did with the original lease, allowing it to update its network configurations to reflect any changes that may have occurred since it first connected to the network. If the host wishes to terminate a lease before its expiration it can send a release message to the DHCP server, which will then make the IP address available for use by others.
Your gateway's DHCP server:

- Displays a list of all DHCP host devices connected to OpenRG
- Defines the range of IP addresses that can be allocated in the LAN
- Defines the length of time for which dynamic IP addresses are allocated
- Provides the above configurations for each LAN device and can be configured and enabled/ disabled separately for each LAN device
- Enables you to assign a static IP lease to a LAN computer, so that the computer will receive the same IP address each time it connects to the network, even if this IP address is within the range of addresses that the DHCP server may assign to other computers
- Provides the DNS server with the host name and IP address of each computer that is connected to the LAN

4.9.1 Viewing and Configuring the DHCP Settings

To view the DHCP server's settings,either use its link in the 'Advanced' tab under the 'Services' screen, or click the 'IP Address Distribution' icon in the 'Advanced' screen. The 'IP Address Distribution' screen appears.

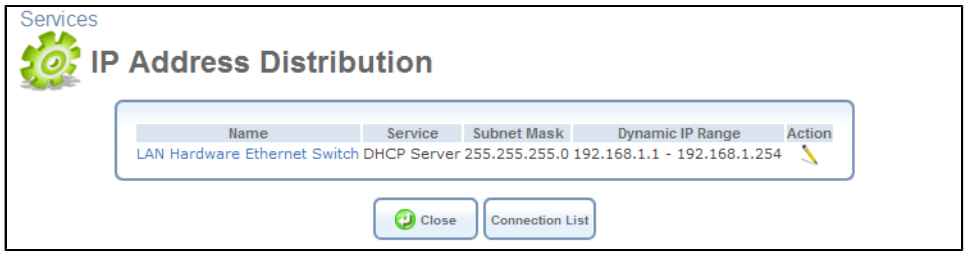

Figure 4.268 IP Address Distribution

To edit the DHCP server settings for a device:

1. Click the device's action icon . The DHCP settings screen for this device appears.

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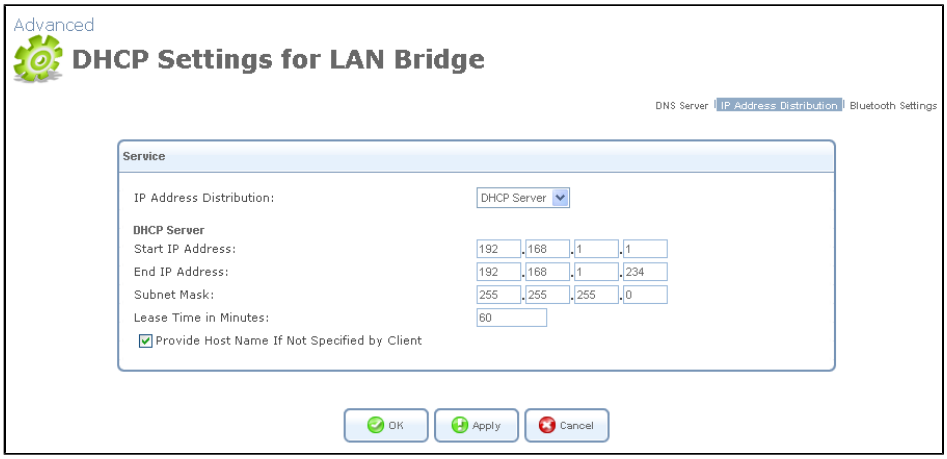

Figure 4.269 DHCP Settings for LAN Bridge

2. Select the DHCP service:

   Disabled Disable the DHCP server for this device.

   DHCP Server Enable the DHCP server for this device.

3. In case you have chosen DHCP Server, complete the following fields:

   Start IP Address The first IP address that may be assigned to a LAN host. Since the LAN interface's default IP address is 192.168.1.1, it is recommended that the first address assigned to a LAN host will be 192.168.1.2 or greater.

   End IP Address The last IP address in the range that can be used to automatically assign IP addresses to LAN hosts.

   Subnet Mask A mask used to determine to what subnet an IP address belongs. An example of a subnet mask value is 255.255.255.0.

   Lease Time In Minutes Each device will be assigned an IP address by the DHCP server for this amount of time, when it connects to the network. When the lease expires the server will determine if the computer has disconnected from the network. If it has, the server may reassign this IP address to a newly-connected computer. This feature ensures that IP addresses that are not in use will become available for other computers on the network.

   Provide Host Name If Not Specified by Client If the DHCP client does not have a host name, the gateway will automatically assign one for it.

4. Click 'OK' to save the settings.

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4.9.2 DHCP Connections

To view a list of computers currently recognized by the DHCP server, click the 'Connection List' button that appears at the bottom of the 'IP Address Distribution' screen (see Figure 4.268). The 'DHCP Connections' screen appears.

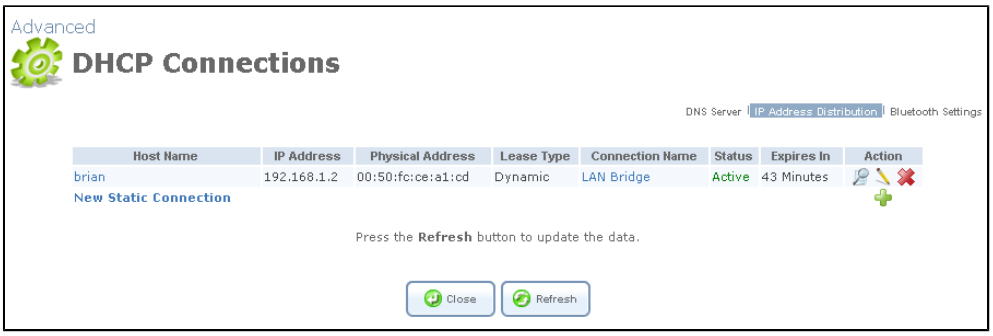

Figure 4.270 DHCP Connections

To define a new connection with a fixed IP address:

1. Click the 'New Static Connection' link. The 'DHCP Connection Settings' screen appears:

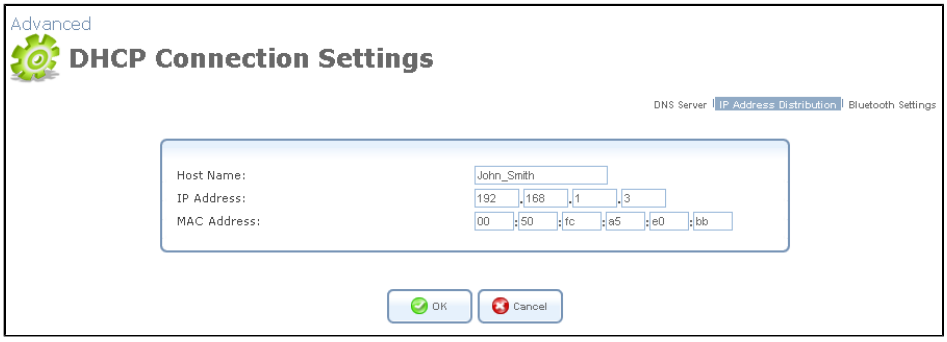

Figure 4.271 DHCP Connection Settings

2. Enter a host name for this connection.
3. Enter the fixed IP address that you would like to have assigned to the computer.
4. Enter the MAC address of the computer's network card.

> Note: A device's fixed IP address is actually assigned to the specific network card's (NIC) MAC address installed on the LAN computer. If you replace this network card then you must update the device's entry in the DHCP Connections list with the new network card's MAC address.

5. Click 'OK' to save the settings.

The 'DHCP Connections' screen will reappear (see Figure 4.272), displaying the defined static connection. This connection can be edited or deleted using the standard action icons.

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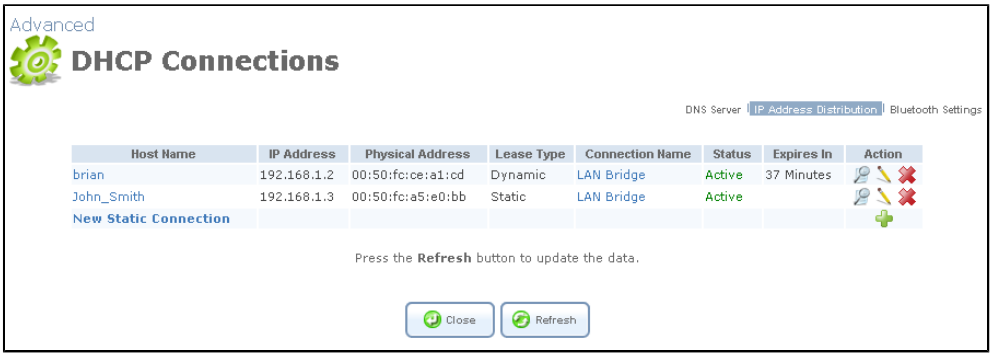

Figure 4.272 DHCP Connections

4.10 Parental Control

The abundance of harmful information on the Internet is posing a serious challenge for employers and parents alike - "How can I regulate what my employee/child does on the net?" OpenRG's Web-filtering allows parents and employers to regulate, control and monitor Internet access. By classifying and categorizing online content, it is possible to create numerous Internet access policies, and easily apply them to your home network computers. As a result, you may keep your children from harm's way by limiting access to adult and violent material, or increase employee productivity by regulating access to non work-related Internet content.

To effectively filter Web content one must first have a good idea of the kind of information that is available on the Internet. It is necessary to formulate a landscape of the accessible content, categorize and classify themes and subjects that may be considered inappropriate.

OpenRG's Parental Control categorization methodology provides an easy and straightforward method for fine-grained content filtering. The Parental Control module is constantly updated with URL-based information classified according to the following categories:

- Child protection
- Recreation and Entertainment
- Personal business
- Bandwidth control
- Advertisements
- Chat
- Remote Proxies and Hosting Sites (possibly untrusted sources)
- Other

Each category can be expanded into subcategories for better content control. For instance, the 'Recreation and Entertainment' category is comprised of subcategories such as:

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- Arts and Entertainment
- Education
- Games
- Hobbies and Recreation

4.10.1 Overview

OpenRG's Parental Control service is provided by "Surf Control", a company specializing in Internet content filtering. Therefore, you must subscribe to this service in order to use this feature. You can subscribe through OpenRG's WBM, as described in the following section.

1. Under the 'Services; tab, click the 'Parental Control' menu item. The Parental Control's 'General' screen appears.

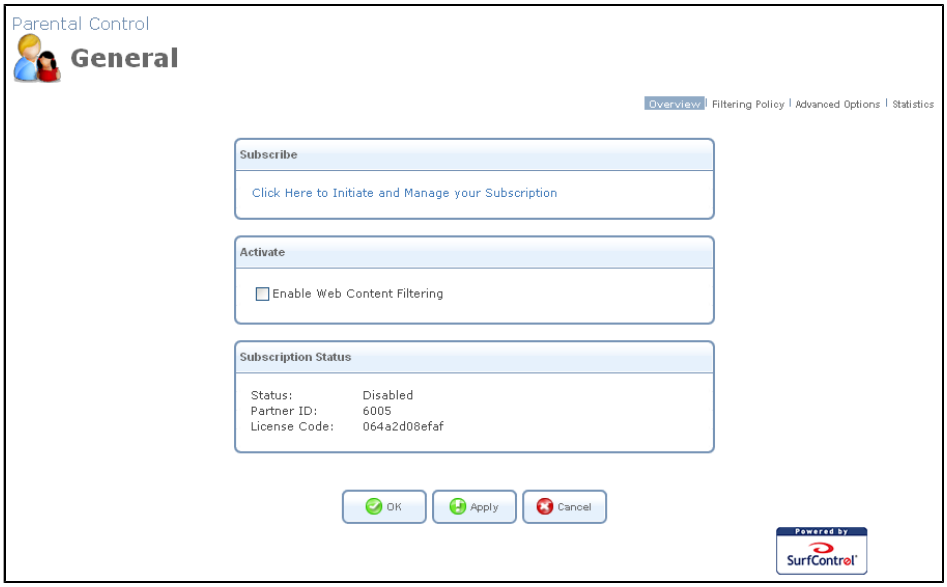

Figure 4.273 General

2. In the 'Activate' section, select the 'Enable Web Content Filtering' check box, and click 'Apply'. A 'Server Status' section is added.

3. If you have not subscribed yet or your subscription has expired, click the 'Click Here to Initiate and Manage your Subscription' link in the 'Subscribe' section. The Web filtering subscription site will then be displayed in a new browser window.

4. Follow the instructions on the site and subscribe for a free trial. You will be sent a verification email. Click the link in the verification email. Your subscription will be activated soon after clicking the verification link.

5. Return to OpenRG's WBM, and click the 'Parental Control' menu item under the 'Services' tab. The 'Filtering Policy' screen should be displayed with subscription expiry date at the

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top. If this is not the case, click the 'Advanced Options' link and then the 'Refresh Servers' button. Wait a few seconds and repeat this step.

4.10.2 Filtering Policy

4.10.2.1 Creating a Filtering Policy

A filtering policy defines which sites will be blocked based on their category. OpenRG provides four built-in policies:

Home Blocks sites under the 'Child Protection' category.

Employee Blocks sites from non work-related categories.

Block All Blocks all access to the Internet.

Allow All Allows unlimited Internet access.
These policies can be set from the 'Default Filtering Policy' drop-down menu in the 'Filtering Policy' screen (see Figure 4.274). To view or edit the 'Home' and 'Employee' policies, click their respective links in this screen. To create your own filtering policy, perform the following:

1. Click the 'Filtering Policy' link under the 'Parental Control' menu item. The 'Filtering Policy' screen appears.

Figure 4.274 Filtering Policy

2. Click the 'Add a policy' link. The following screen appears.

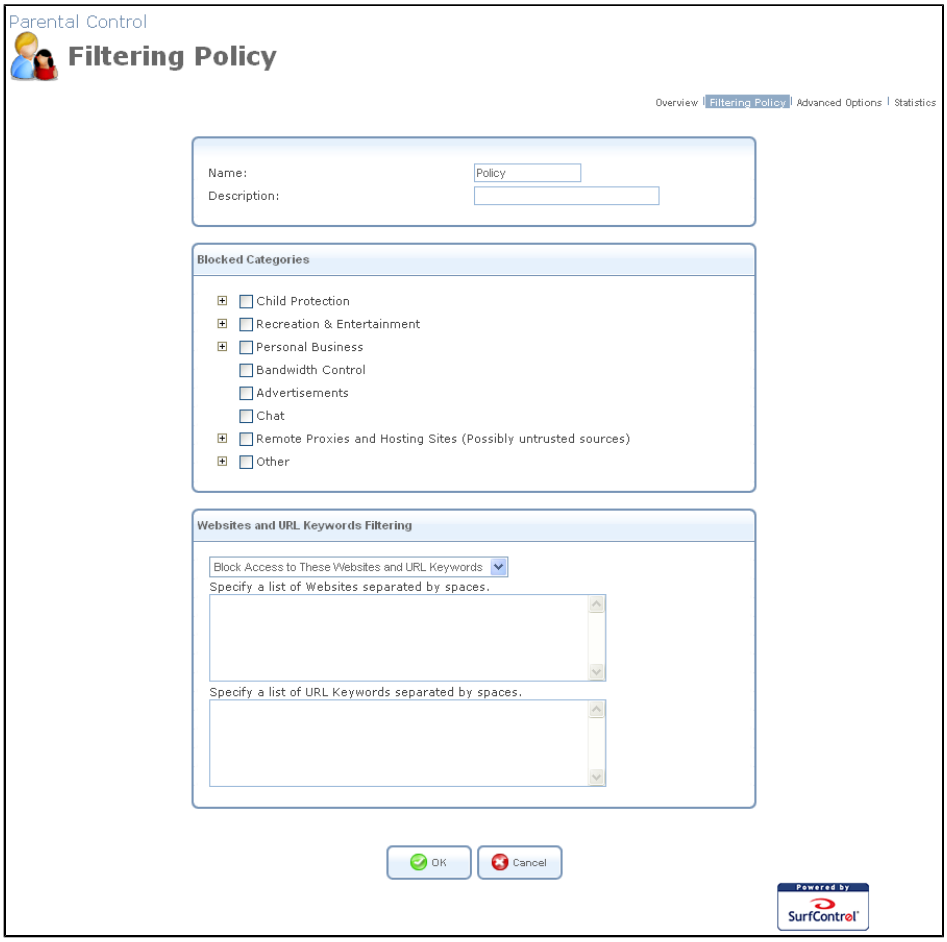

Figure 4.275 Creating a Filtering Policy

3. Enter a name and a description for the new policy.

4. Select the content filtering check boxes, which represent content you would like to block. Selecting a category will automatically select all its sub-categories and vice versa. If you would like to make a more refined selection of filtering options, click the plus sign (+) next to each category to display a list of its sub-categories. Note that clicking the minus sign (-) of a category will only be possible if all its sub-categories are either checked or unchecked.

5. You can also manually specify a list of Web sites and a list of URL keywords in the provided text fields, to which you can either block or allow access using the corresponding drop-down menu.

6. Click 'OK' to save the settings.

4.10.2.2 Applying the Filtering Policy

Once you have created different filtering policies, you can either define a default policy that will be applied to all of your LAN computers, or apply different policies to individual computers separately:

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- LAN Filtering Policy – To select a default filtering policy for the LAN, select the policy name from the 'Default Filtering Policy' drop-down menu located in the 'Filtering Policy' screen (see Figure 4.274), and click Apply.

- PC Filtering Policy – To apply separate policies to individual home computers, perform the following:

  1. In the 'Filtering Policy' screen (see Figure 4.274), click the 'Add a LAN Computer' link. The 'LAN Computer Policy' screen appears.

Figure 4.276 LAN Computer Policy

  2. Enter the name or IP address of the LAN computer to which you wish to apply a policy.

  3. Select the policy you wish to apply in the 'Policy' drop-down menu.

  4. By default, the rule will always be active. However, you can define time segments during which the rule may be active, by selecting 'User Defined' from the 'Schedule' drop-down menu. If more than one scheduler rule is defined, the 'Schedule' drop-down menu will allow you to choose between the available rules. To learn how to configure scheduler rules, refer to the 'Defining Scheduler Rules' section of the OpenRG Administrator Manual.

  5. Back in the 'Filtering Policy' screen, use the check box next to the computer name in order to enable or disable its policy.

  6. Click 'OK' to save the settings.

4.10.3 Advanced Options

Click the 'Advanced Options' link of the 'Parental Control' menu item under the 'Services' tab. The 'Advanced Options' screen appears.

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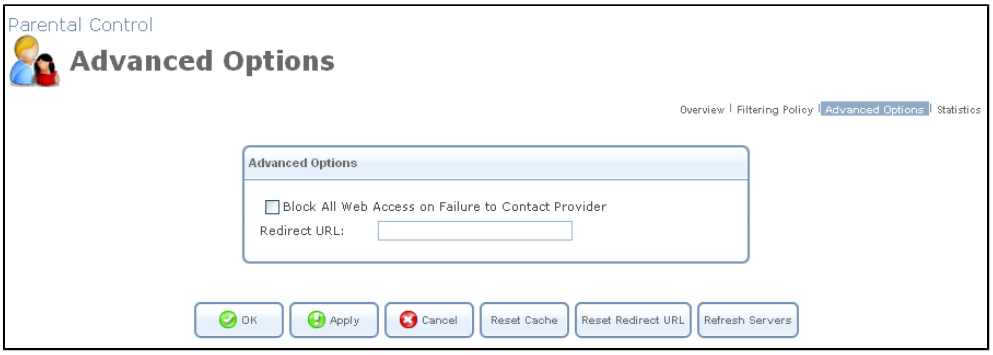

Figure 4.277 Advanced Options

Block All Web Access on Failure to Contact Provider The filtering service provider is consulted about every site's category in order to decide whether to allow or block it. If for any reason the provider cannot be consulted, use this check box to determine whether to block or allow access to all sites.

Redirect URL When a site is blocked, an OpenRG 'Blocked Access' page is displayed (see Figure 4.278), specifying the requested URL and the reason it was blocked. Use this field to specify an alternative page to be displayed when a site is blocked.

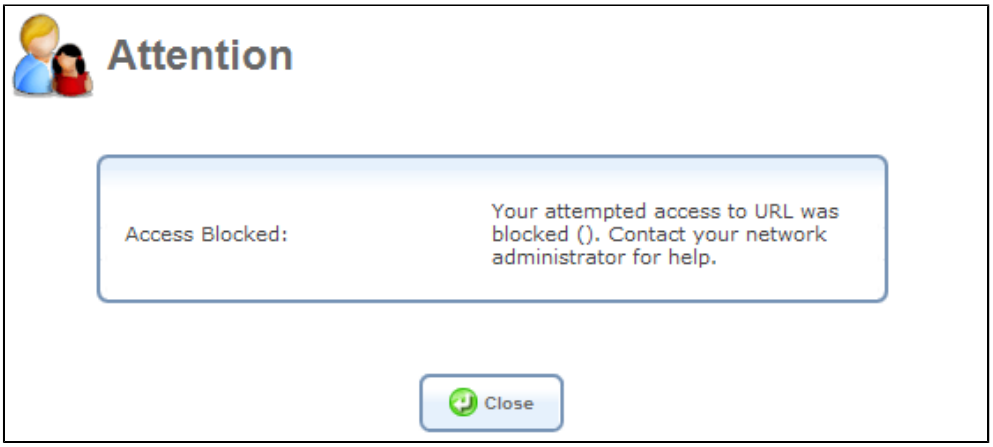

Figure 4.278 Blocked Access

4.10.4 Statistics

Click the 'Statistics' link of the 'Parental Control' menu item under the 'Services' tab. The 'Statistics' screen appears.

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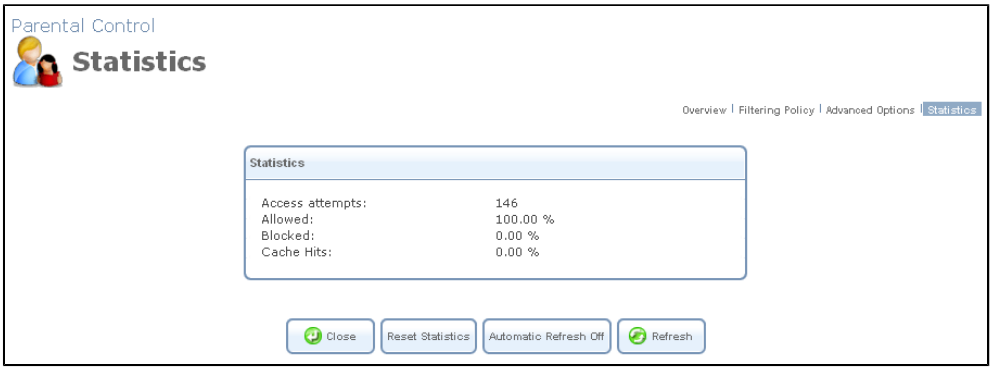

Figure 4.279 Statistics

The 'Statistics' screen monitors content filtering statistics. The statistics include a record of:

- Access attempts
- Allowed URLs
- Blocked URLs
- URLs that were accessed from Cache memory

Note: When Parental Control is enabled, HTTP services cannot be blocked by the 'Security Access Control' feature (refer to Section 4.2.2).

4.11 Virtual Private Network

4.11.1 Internet Protocol Security

Internet Protocol Security (IPSec) is a series of guidelines for the protection of Internet Protocol (IP) communications. It specifies procedures for securing private information transmitted over public networks. The IPSec protocols include:

- AH (Authentication Header) provides packet-level authentication.
- ESP (Encapsulating Security Payload) provides encryption and authentication.
- IKE (Internet Key Exchange) negotiates connection parameters, including keys, for the other two services.

Services supported by the IPSec protocols (AH, ESP) include confidentiality (encryption), authenticity (proof of sender), integrity (detection of data tampering), and replay protection (defense against unauthorized resending of data). IPSec also specifies methodologies for key management. Internet Key Exchange (IKE), the IPSec key management protocol, defines a series of steps to establish keys for encrypting and decrypting information; it defines a common language on which communications between two parties is based. Developed by the Internet

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Engineering Task Force (IETF), IPSec and IKE together standardize the way data protection is performed, thus making it possible for security systems developed by different vendors to interoperate.

4.11.1.1 Technical Specifications

- Security architecture for the Internet Protocol
- IP Security Document Roadmap
- Connection type: Tunnel, Transport
- Use of Internet Security Association and Key Management Protocol (ISAKMP) in main and aggressive modes
- Key management: Manual, Automatic (Internet Key Exchange)
- NAT Traversal Negotiation for resolution of NATed tunnel endpoint scenarios
- Dead Peer Detection for tunnel disconnection in case the remote endpoint ceases to operate
- Gateway authentication: X.509, RSA signatures and pre-shared secret key
- IP protocols: ESP, AH
- Encryption: AES, 3DES, DES, NULL, HW encryption integration (platform dependent)
- Authentication: MD5, SHA-1
- IP Payload compression
- Interoperability: VPNC Certified IPSec, Windows 2000, Windows NT, FreeS/WAN, FreeBSD, Checkpoint Firewall-1, Safenet SoftRemote, NetScreen, SSH Sentinel

4.11.1.2 IPSec Settings

Access this feature either from the 'VPN' menu item under the 'Services' tab, or by clicking its icon in the 'Advanced' screen. The 'Internet Protocol Security (IPSec)' screen appears.

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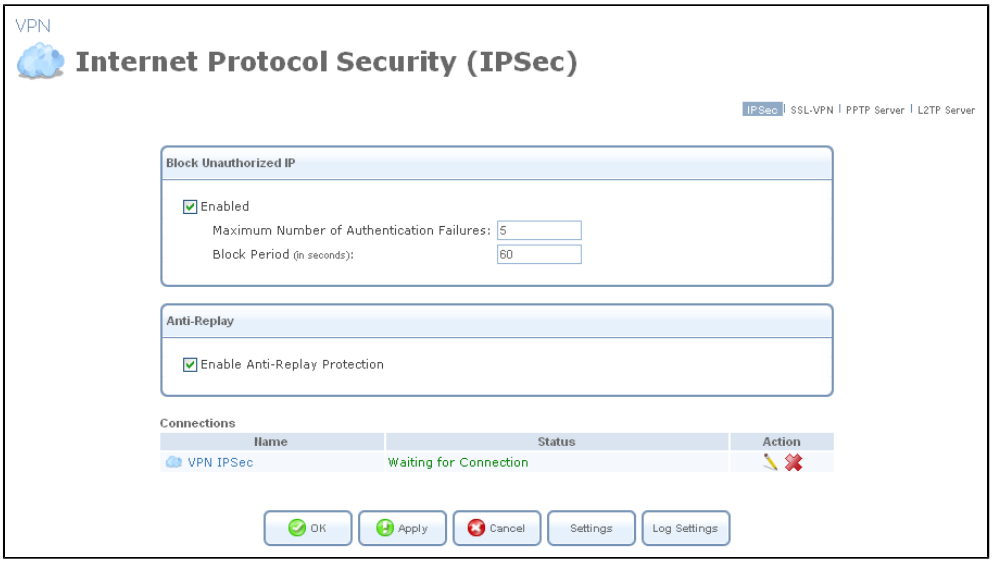

Figure 4.280 Internet Protocol Security (IPSec)

This screen enables you to configure the following settings:

Block Unauthorized IP Select the 'Enabled' check box to block unauthorized IP packets to OpenRG. Specify the following parameters:

- **Maximum Number of Authentication Failures** The maximum number of packets to authenticate before blocking the origin's IP address.
- **Block Period (in seconds)** The timeframe during which OpenRG will drop packets from an unauthorized IP address.

Enable Anti-Replay Protection Select this option to enable dropping of packets that are recognized (by their sequence number) as already been received.

Connections This section displays the list of IPSec connections. To learn how to create an IPSec connection, refer to the "Setting Up an IPSec Connection" section of the OpenRG Administrator Manual.

4.11.1.2.1 Public Key Management

The 'Settings' button in the 'Internet Protocol Security (IPSec)' screen enables you to manage OpenRG's public keys.

1. Click the 'Settings' button (see Figure 4.280) to view OpenRG's public key. If necessary, you can copy the public key from the screen that appears.

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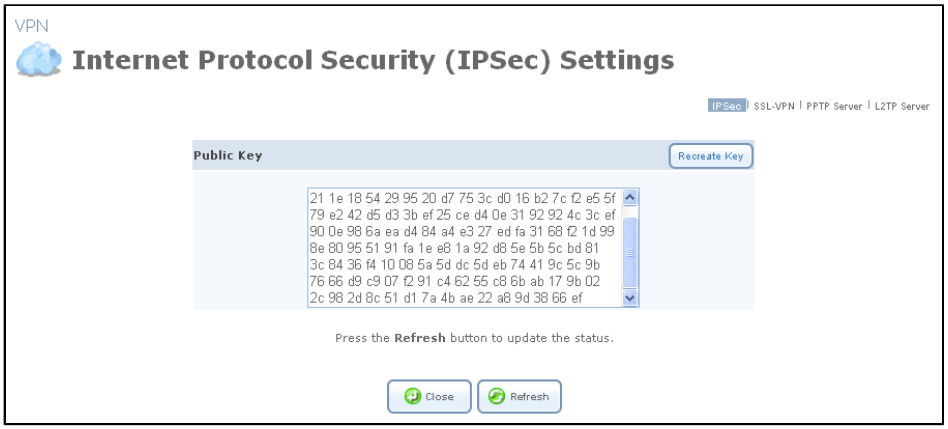
VPN
Internet Protocol Security (IPSec) Settings
IPSec | SSL-VPN | PPTP Server | L2TP Server
Public Key
Recreate Key
21 1e 18 54 29 95 20 d7 75 3c d0 16 b2 7c f2 e5 5f
79 e2 42 d5 d3 3b ef 25 ce d4 0e 31 92 92 4c 3c ef
90 0e 98 6a ea d4 84 a4 e3 27 ed fa 31 68 f2 1d 99
8e 80 95 51 91 fa 1e e8 1a 92 d8 5e 5b 5c bd 81
3c 84 36 f4 10 08 5a 5d dc 5d eb 74 41 9c 5c 9b
76 66 d9 c9 07 f2 91 c4 62 55 c8 6b ab 17 9b 02
2c 98 2d 8c 51 d1 7a 4b ae 22 a8 9d 38 66 ef
Press the Refresh button to update the status.
Close
Refresh

Figure 4.281 Internet Protocol Security (IPSec) Settings

2. Click the 'Recreate Key' button to recreate the public key, or the 'Refresh' button to refresh the key displayed in this screen.

4.11.1.2.2 Log Settings

The IPSec Log can be used to identify and analyze the history of the IPSec package commands, attempts to create connections, etc. The IPSec activity, as well as that of other OpenRG modules, are displayed together in this view.

1. Click the 'Log Settings' button. The 'IPSec Log Settings' screen appears (see Figure 4.282).
2. Select the check boxes relevant to the information you would like the IPSec log to record.
3. Click 'OK' to save the settings.

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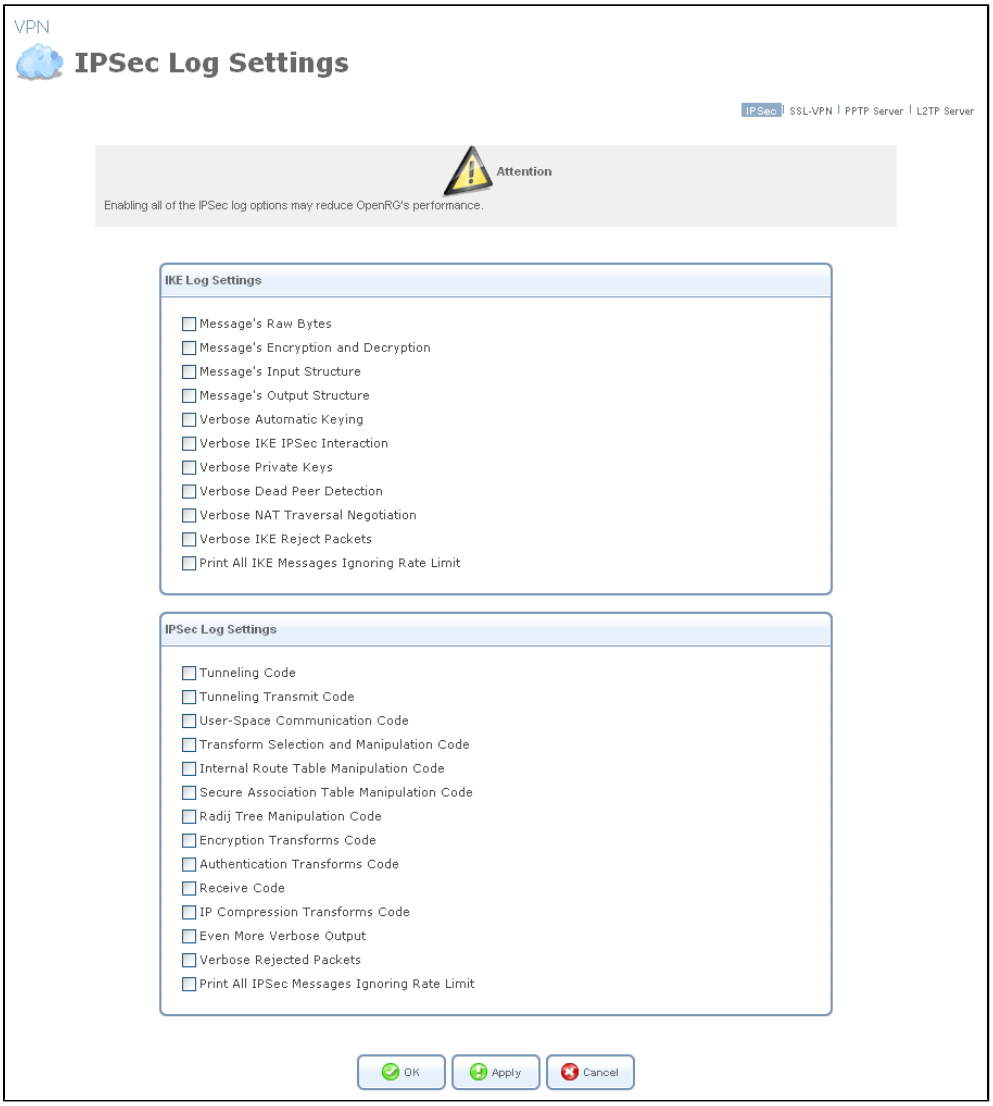

Figure 4.282 IPSec Log Settings

4.11.1.3 IPSec Connection Settings

The IPSec connections are displayed under the 'Connections' section of the 'Internet Protocol Security (IPSec)' screen (see Figure 4.280). To configure an IPSec connection settings, perform the following:

1. Click the connection's action icon . The 'VPN IPSec Properties' screen appears, displaying the 'General' sub-tab.

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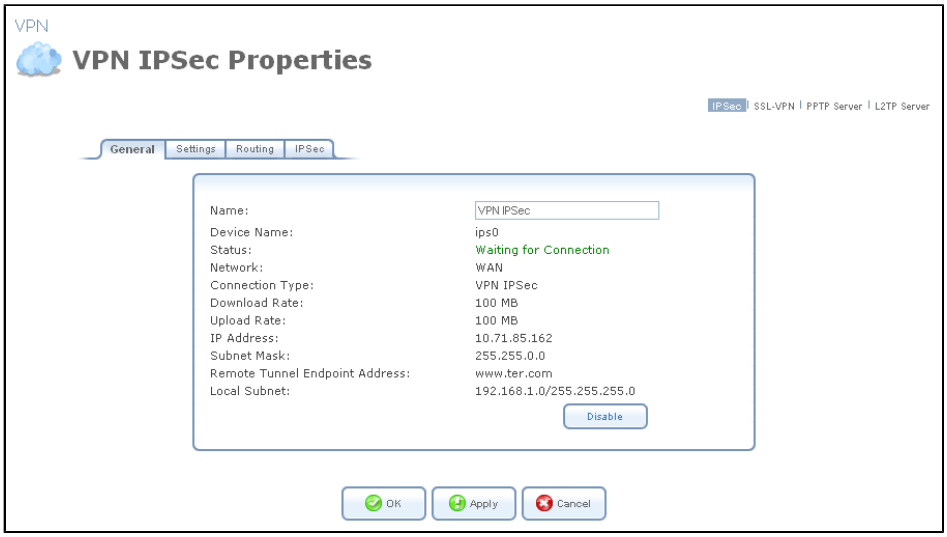

Figure 4.283 VPN IPSec Properties – General

2. Click the 'Settings' sub-tab, and configure the following settings:

Figure 4.284 VPN IPSec Properties – Settings

Schedule By default, the connection will always be active. However, you can configure scheduler rules in order to define time segments during which the connection may be active. Once a scheduler rule(s) is defined, the drop-down menu will allow you to choose between the available rules. To learn how to configure scheduler rules, refer to the 'Defining Scheduler Rules' section of the OpenRG Administrator Manual.

Network Select whether the parameters you are configuring relate to a WAN, LAN or DMZ connection, by selecting the connection type from the drop-down menu. For more information, refer to refer to the 'Network Types' section of the OpenRG Administrator Manual. Note that when defining a network connection as DMZ, you must also:

- Remove the connection from under a bridge, if that is the case.
- Change the connection's routing mode to "Route", in the 'Routing' sub-tab.
- Add a routing rule on your external gateway (which may be supplied your ISP), informing of the DMZ network behind OpenRG.

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3. Click the 'Routing' sub-tab, and define the connection's routing rules. To learn how to create routing rules, refer to refer to the 'Routing' section of the OpenRG Administrator Manual.

Figure 4.285 VPN IPSec Properties – Routing

4. Click the 'IPSec' sub-tab, and configure the following settings.

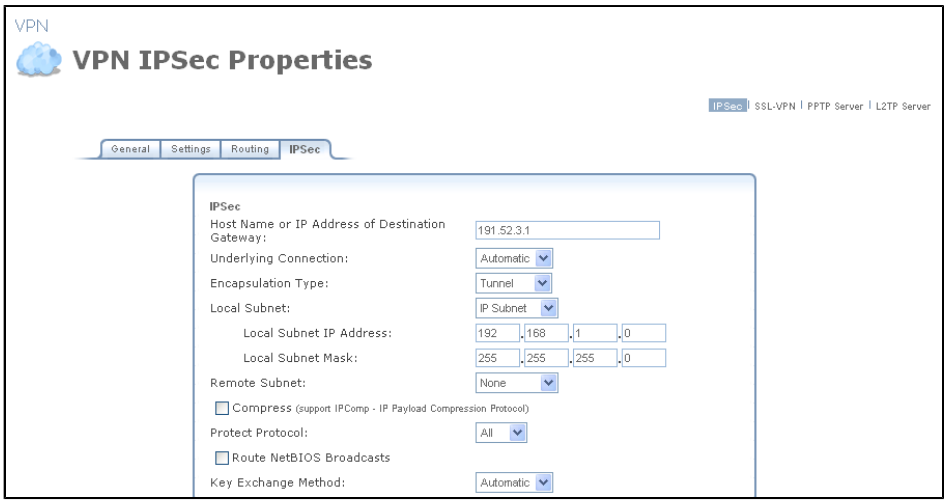

Figure 4.286 VPN IPSec Properties – IPSec

Host Name or IP Address of Destination Gateway The IP address of your IPSec peer. If your connection is an IPSec Server, this field will display "Any Remote Gateway".

Underlying Connection In a single WAN scenario, the underlying connection parameter will be set to "Automatic" (non-configurable). However, if you have multiple WAN devices, a drop-down menu will appear (see Figure 4.284), enabling you to choose the underlying WAN device. The IPSec connection will only use your chosen device, unless failover is enabled. In this case, the failed-to device will be used instead (assuming its route rules consent), until the chosen device is up again. Note that if you select "Automatic", there will be no attempt to return to the original device from the failed-to device. For more information about failover, refer to refer to the 'Failover' section of the OpenRG Administrator Manual.

Encapsulation Type Select between 'Tunneling' or 'Transport' encapsulation. 'Transport' encapsulation is performed between two gateways (no subnets), and therefore needs no explicit configuration. 'Tunneling' requires that you configure the following parameters:

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- **Local Subnet** Define your local endpoint, by selecting one of the following options:

  IP Subnet (default) Enter OpenRG's Local Subnet IP Address and Local Subnet Mask.

  IP Range Enter the 'From' and 'To' IP addresses, forming the endpoints range of the local subnet(s).

  IP Address Enter the Local IP Address to define the endpoint as a single host.

  None Select this option if you do not want to define a local endpoint. The endpoint will be set to the gateway.

- **Remote Subnet** This section is identical to the 'Local Subnet' section above, but is for defining the remote endpoint.

  Compress (Support IPComp protocol) Select this check box to compress packets during encapsulation with the IP Payload Compression protocol. Please note that this reduces performance (and is therefore unchecked by default).

Protect Protocol Select the protocols to protect with IPSec: All, TCP, UDP, ICMP or GRE. When selecting TCP or UDP, additional source port and destination port drop-down menus will appear, enabling you to select 'All' or to specify 'Single' ports in order to define the protection of specific packets. For example, in order to protect L2TP packets, select UDP and specify 1701 as both single source and single destination ports.

Route NetBIOS Broadcasts Select this option to allow NetBIOS packets through the IPSec tunnel, which otherwise would not meet the routing conditions specified.

Key Exchange Method The IPSec key exchange method can be 'Automatic' (the default) or 'Manual'. Selecting one of these options will alter the rest of the screen.

1. Automatic key exchange settings:

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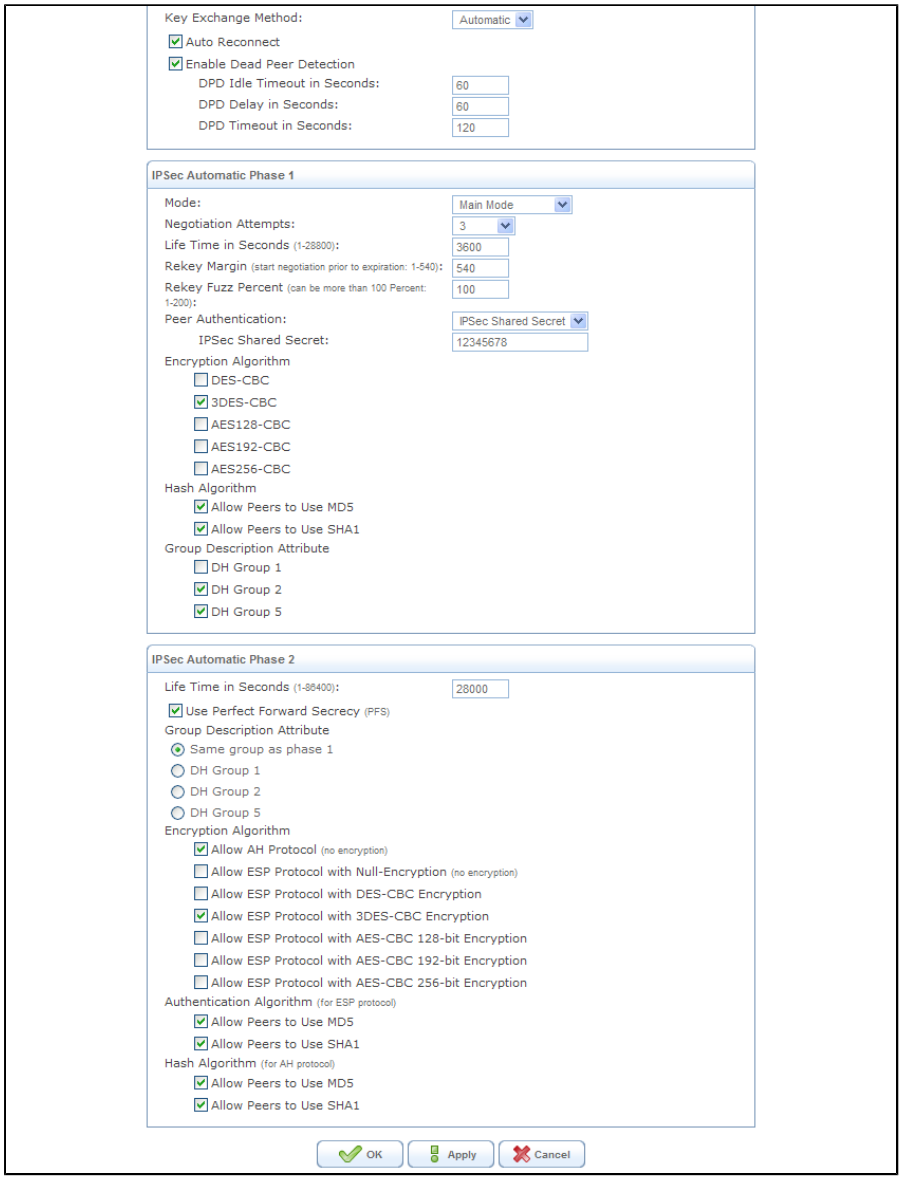

Figure 4.287 Automatic Key Exchange Settings

Auto Reconnect The IPSec connection will reconnect automatically if disconnected for any reason.

Enable Dead Peer Detection OpenRG will detect whether the tunnel endpoint has ceased to operate, in which case will terminate the connection. Note that this feature will be functional only if the other tunnel endpoint supports it. This is determined during the negotiation phase of the two endpoints.

- **DPD Idle Timeout in Seconds** Defines how long the IPSec tunnel can be idle before OpenRG sends the first DPD message to the remote peer, in order to check if it is alive.

- **DPD Delay in Seconds** Defines how long OpenRG will wait for the peer's response to the DPD message, before sending an additional message (in case of response failure).

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- **DPD Timeout in Seconds** Defines how long OpenRG will try to contact the peer, before it declares the peer dead and terminates the connection.

IPSec Automatic Phase 1 – Peer Authentication

- **Mode** Select the IPSec mode – either 'Main Mode' or 'Aggressive Mode'. Main mode is a secured but slower mode, which presents negotiable propositions according to the authentication algorithms that you select in the check boxes. Aggressive Mode is faster but less secured. When selecting this mode, the algorithm check boxes are replaced by radio buttons, presenting strict propositions according to your selections.

- **Negotiation attempts** Select the number of negotiation attempts to be performed in the automatic key exchange method. If all attempts fail, OpenRG will wait for a negotiation request.

- **Life Time in Seconds** The timeframe in which the peer authentication will be valid.

- **Rekey Margin** Specifies how long before connection expiry should attempts to negotiate a replacement begin. It is similar to that of the key life time and is given as an integer denoting seconds.

- **Rekey Fuzz Percent** Specifies the maximum percentage by which Rekey Margin should be randomly increased to randomize re-keying intervals.

- **Peer Authentication** Select the method by which OpenRG will authenticate your IPSec peer.

  - **IPSec Shared Secret** – Enter the IPSec shared secret.

  - **RSA Signature** – Enter the peer's RSA signature (based on OpenRG's public key), as described in Section 4.11.1.5.3.

  - **Certificate** – If a certificate exists on OpenRG, it will appear when you select this option. Enter the certificate's local ID and peer ID. To learn how to add certificates to OpenRG, refer to the 'Creating and Loading Digital Certificates' section of the OpenRG Administrator Manual.

- **Encryption Algorithm** Select the encryption algorithms that OpenRG will attempt to use when negotiating with the IPSec peer.

- **Hash Algorithm** Select the hash algorithms that OpenRG will attempt to use when negotiating with the IPSec peer.

- **Group Description Attribute** Select the Diffie-Hellman (DH) group description(s). Diffie-Hellman is a public-key cryptography scheme that allows two parties to establish a shared secret over an insecure communications channel.

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IPSec Automatic Phase 2 – Key Definition

- **Life Time in Seconds** The length of time before a security association automatically performs renegotiation.
- **Use Perfect Forward Secrecy (PFS)** Select whether Perfect Forward Secrecy of keys is required on the connection's keying channel (with PFS, penetration of the key-exchange protocol does not compromise keys negotiated earlier). Deselecting this option will hide the next parameter.

  Group Description Attribute Select whether to use the same group chosen in phase 1, or reselect specific groups.
- **Encryption Algorithm** Select the encryption algorithms that OpenRG will attempt to use when negotiating with the IPSec peer.
- **Authentication Algorithm (for ESP protocol)** Select the authentication algorithms that OpenRG will attempt to use when negotiating with the IPSec peer.
- **Hash Algorithm (for AH protocol)** Select the hash algorithms that OpenRG will attempt to use when negotiating with the IPSec peer.

2. Manual key definition:

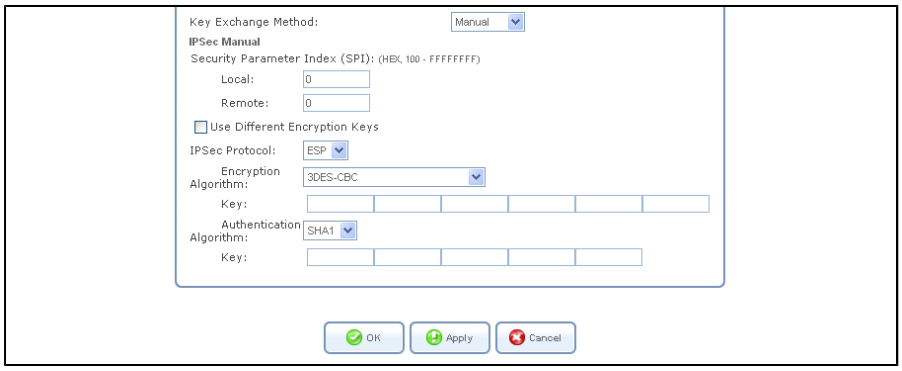

Figure 4.288 Manual Key Definition

Security Parameter Index (SPI): (HEX, 100 - FFFFFFFF) A 32 bit value that together with an IP address and a security protocol, uniquely identifies a particular security association. The local and remote values must be coordinated with their respective values on the IPSec peer.

Use Different Encryption Keys Selecting this option allows you to define both local and remote algorithm keys when defining the IPSec protocol (in the next section).

IPSec Protocol Select between the ESP and AH IPSec protocols. The screen will refresh accordingly:

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- **ESP** – Select the encryption and authentication algorithms, and enter the algorithm keys in hexadecimal representation.
- **AH** – Select the hash algorithm, and enter the algorithm key in hexadecimal representation.

5. Click 'OK' to save the settings.

4.11.1.4 IPSec Gateway-to-Host Connection Scenario

In order to create an IPSec connection between OpenRG and a Windows host, you need to configure both the gateway and the host. This section describes both OpenRG's configuration and a Windows XP client configuration.

4.11.1.4.1 Configuring IPSec on OpenRG

1. Under the 'System' tab, click the 'Network Connections' menu item. The 'Network Connections' screen appears.

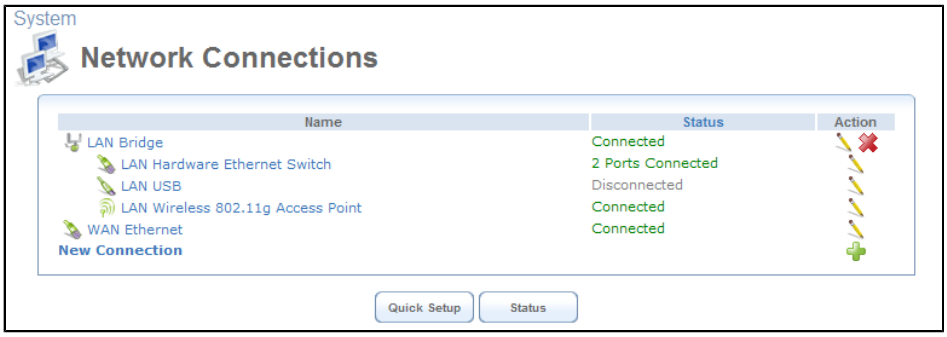

Figure 4.289 Network Connections

2. Click the 'New Connection' link. The 'Connection Wizard' screen appears.

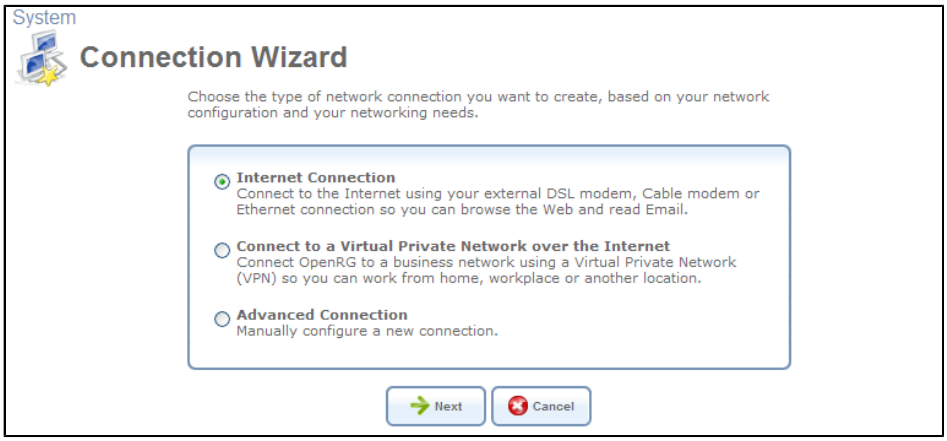
System
Connection Wizard
Choose the type of network connection you want to create, based on your network configuration and your networking needs.
Internet Connection
Connect to the Internet using your external DSL modem, Cable modem or Ethernet connection so you can browse the Web and read Email.
Connect to a Virtual Private Network over the Internet
Connect OpenRG to a business network using a Virtual Private Network (VPN) so you can work from home, workplace or another location.
Advanced Connection
Manually configure a new connection.
Next
Cancel

Figure 4.290 Connection Wizard

3. Select the 'Connect to a Virtual Private Network over the Internet' radio button and click 'Next'. The 'Connect to a Virtual Private Network over the Internet' screen appears.

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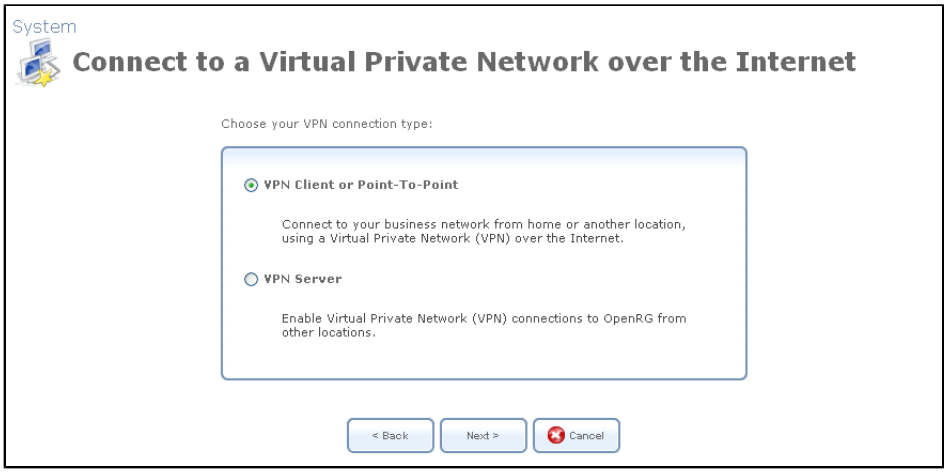
System
Connect to a Virtual Private Network over the Internet
Choose your VPN connection type:
VPN Client or Point-To-Point
Connect to your business network from home or another location, using a Virtual Private Network (VPN) over the Internet.
VPN Server
Enable Virtual Private Network (VPN) connections to OpenRG from other locations.
< Back
Next >
Cancel

Figure 4.291 Connect to a Virtual Private Network over the Internet

4. Select the 'VPN Client or Point-To-Point' radio button and click 'Next'. The 'VPN Client or Point-To-Point' screen appears.

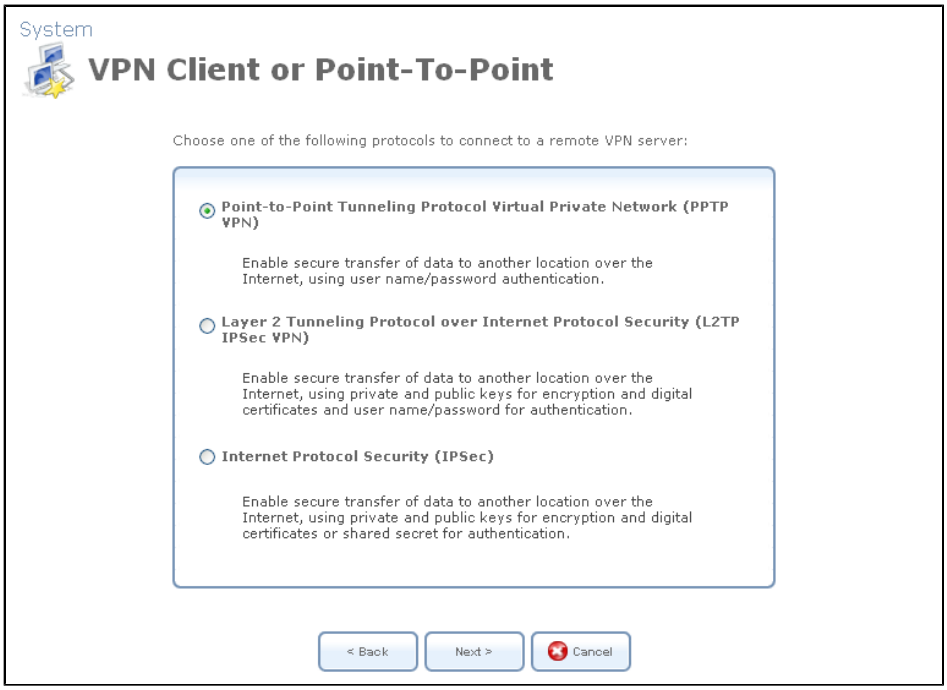
System
VPN Client or Point-To-Point
Choose one of the following protocols to connect to a remote VPN server:
Point-to-Point Tunneling Protocol Virtual Private Network (PPTP VPN)
Enable secure transfer of data to another location over the Internet, using user name/password authentication.
Layer 2 Tunneling Protocol over Internet Protocol Security (L2TP IPSec VPN)
Enable secure transfer of data to another location over the Internet, using private and public keys for encryption and digital certificates and user name/password for authentication.
Internet Protocol Security (IPSec)
Enable secure transfer of data to another location over the Internet, using private and public keys for encryption and digital certificates or shared secret for authentication.
< Back
Next >
Cancel

Figure 4.292 VPN Client or Point-To-Point

5. Select the 'Internet Protocol Security (IPSec)' radio button and click 'Next'. The 'Internet Protocol Security (IPSec)' screen appears.

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Figure 4.293 Internet Protocol Security (IPSec)

6. Specify the following parameters:

   Host Name or IP Address of Destination Gateway Specify 22.23.24.25

   Remote IP Select "Same as Gateway".

   Encapsulation Type Select "Tunnel".

   Shared Secret Enter "hr5x".

7. Click 'Next'. The 'Connection Summary' screen appears.

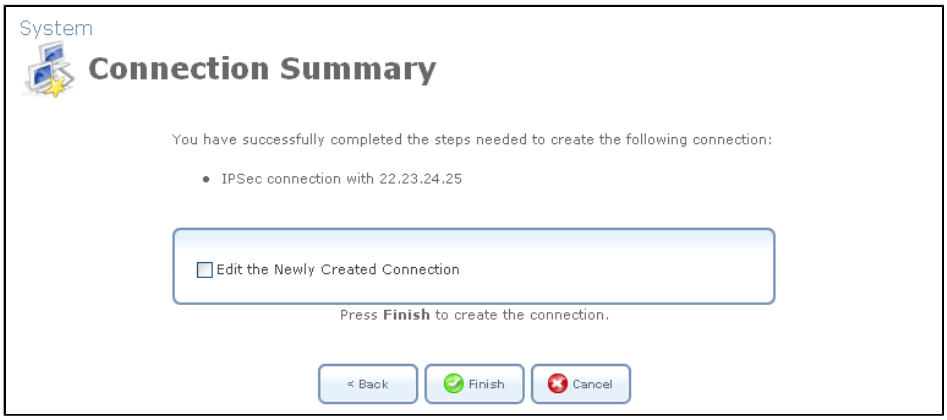

Figure 4.294 Connection Summary

8. Click 'Finish'. The 'Network Connections' screen displays the newly created IPSec connection.

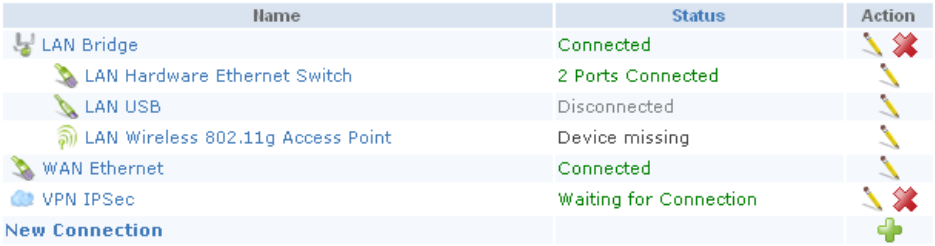

Figure 4.295 New VPN IPSec Connection

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4.11.1.4.2 Configuring IPSec on the Windows Host

The following IP addresses are needed for the host configuration:

- Windows IP address – referred to as <windows_ip>.
- OpenRG WAN IP address – referred to as <openrg_wan_ip>.
- OpenRG LAN Subnet address – referred to as <openrg_lan_subnet>.

The configuration sequence:

1. Creating the IPSec Policy:

   a. Click the Start button and select Run. Type "secpol.msc" and click 'OK'. The 'Local Security Settings' window appears.

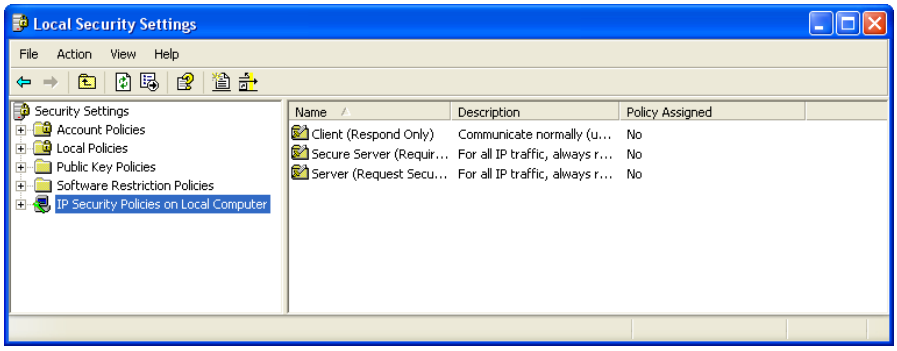

Figure 4.296 Local Security Settings

   b. Right-click the 'IP Security Policies on Local Computer' and choose 'Create IP Security Policy...'. The IP Security Policy Wizard appears.

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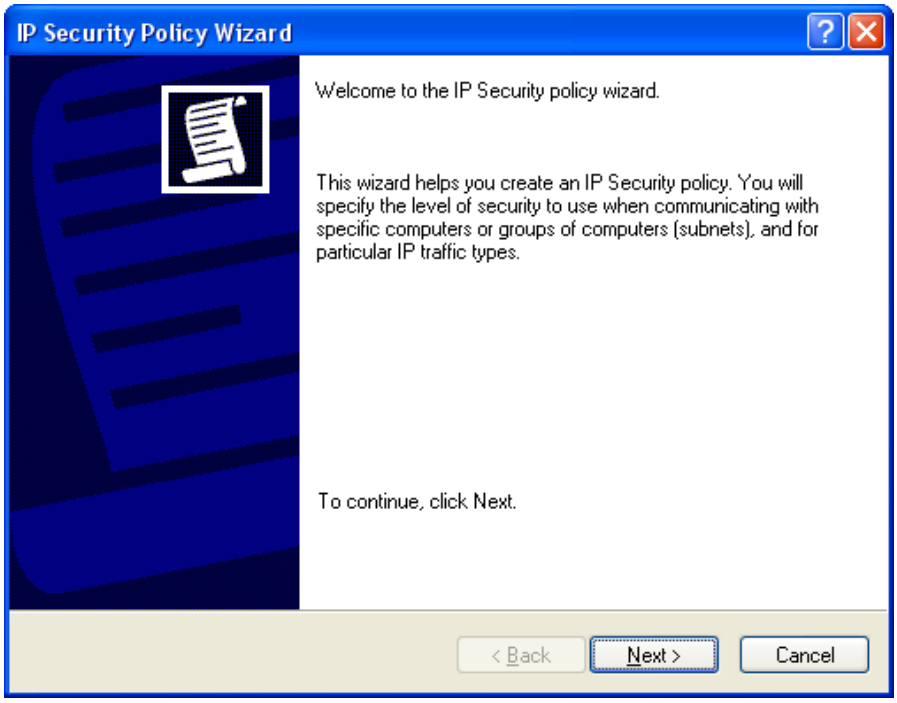
IP Security Policy Wizard
Welcome to the IP Security policy wizard.
This wizard helps you create an IP Security policy. You will specify the level of security to use when communicating with specific computers or groups of computers (subnets), and for particular IP traffic types.
To continue, click Next.
< Back
Next >
Cancel

Figure 4.297 IP Security Policy Wizard

c. Click 'Next' and type a name for your policy, for example "OpenRG Connection".

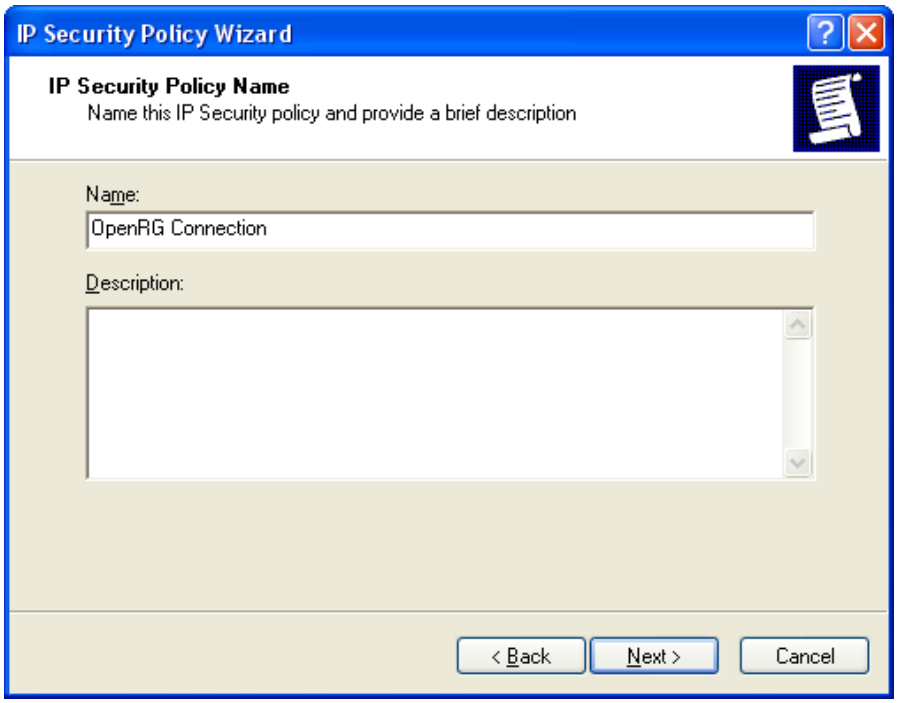

Figure 4.298 IP Security Policy Name

d. Click 'Next'. The 'Requests for Secure Communication' screen appears.

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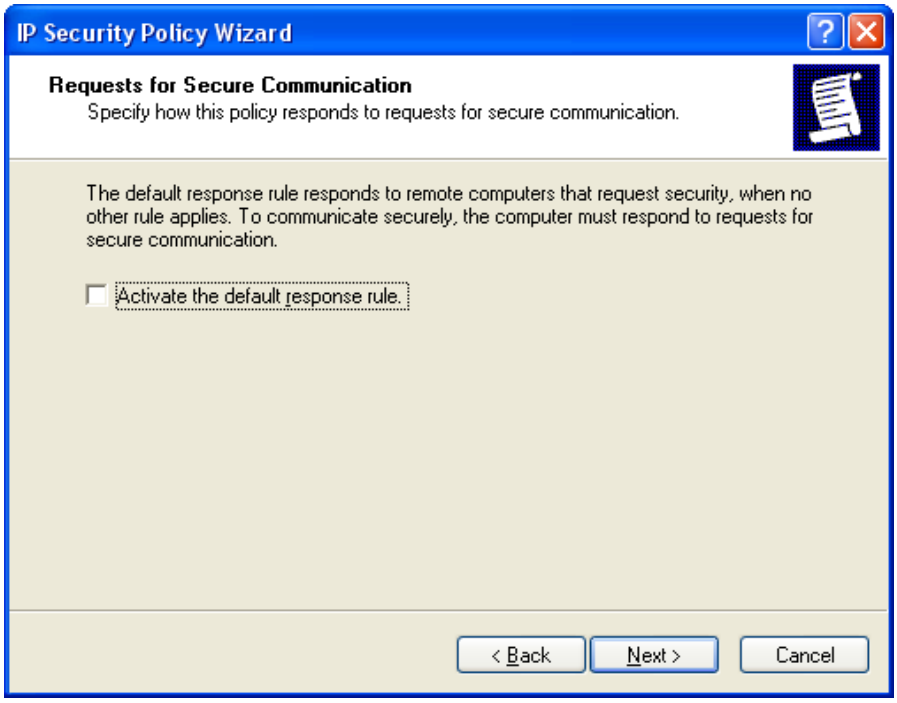
IP Security Policy Wizard
Requests for Secure Communication
Specify how this policy responds to requests for secure communication.
The default response rule responds to remote computers that request security, when no other rule applies. To communicate securely, the computer must respond to requests for secure communication.
Activate the default response rule.
< Back
Next >
Cancel

Figure 4.299 Requests for Secure Communication

e. Deselect the 'Activate the default response rule' check box, and click 'Next'. The 'Completing the IP Security Policy Wizard' screen appears.

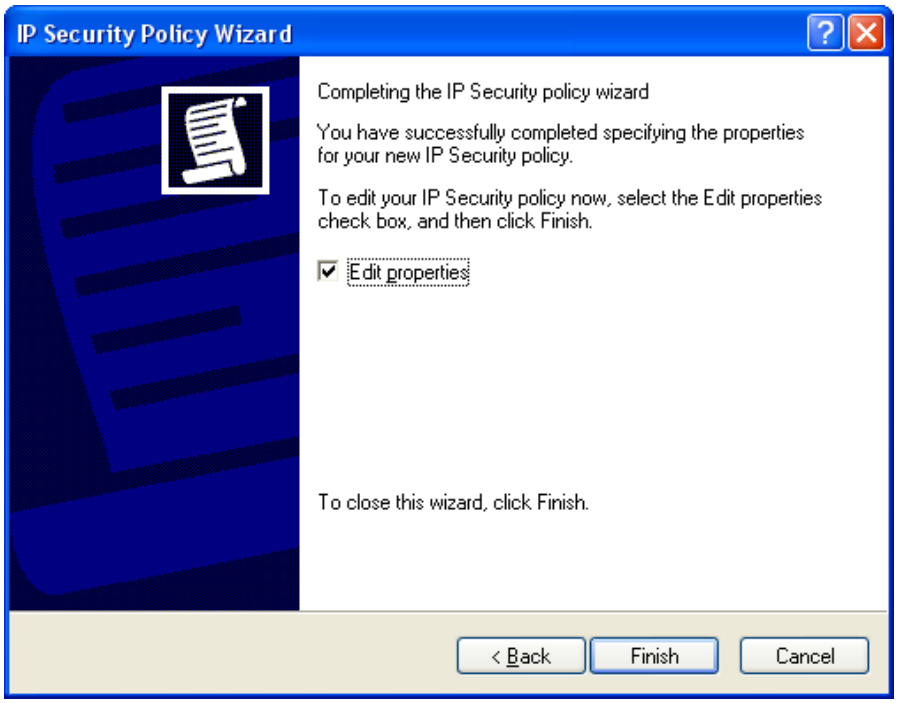
IP Security Policy Wizard
Completing the IP Security policy wizard
You have successfully completed specifying the properties for your new IP Security policy.
To edit your IP Security policy now, select the Edit properties check box, and then click Finish.
Edit properties
To close this wizard, click Finish.
< Back
Finish
Cancel

Figure 4.300 Completing the IP Security Policy Wizard

f. Make sure that the 'Edit Properties' check box is selected, and click 'Finish'. The 'OpenRG Connection Properties' window appears.

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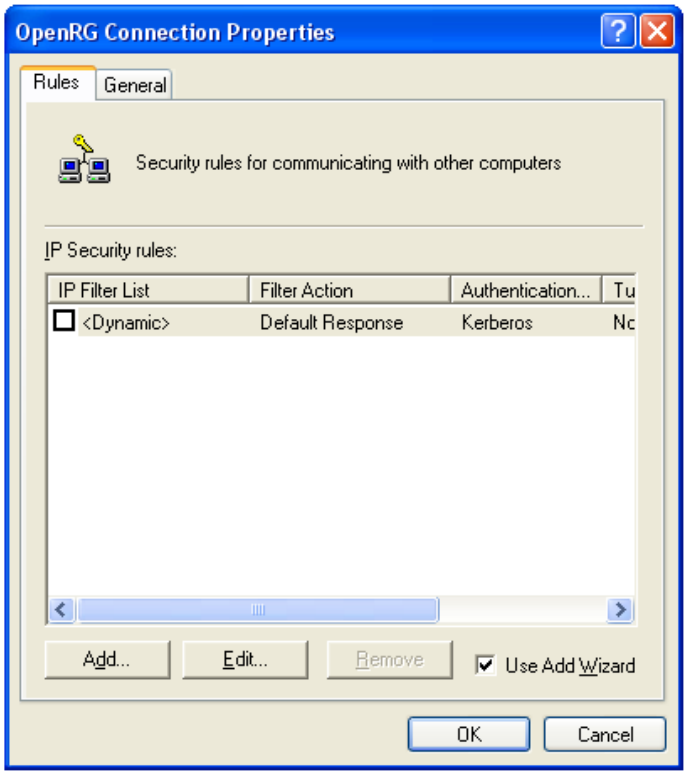

Figure 4.301 OpenRG Connection Properties

g. Click 'OK'.

2. Building Filter List 1 – Windows XP to OpenRG:

   a. In the 'Local Security Settings' window, right-click the new 'OpenRG Connection' policy, created in the previous step, and select Properties. The Properties window appears (see Figure 4.301).

   b. Deselect the 'Use Add Wizard' check box and click the 'Add' button to create a new IP Security rule. The 'New Rule Properties' window appears.

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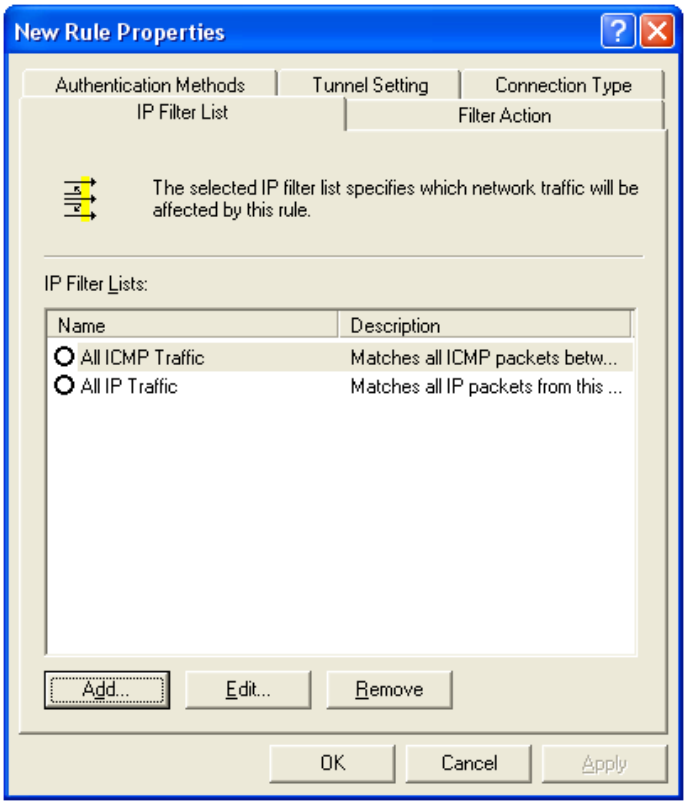

Figure 4.302 New Rule Properties

c. Under the IP Filter List tab, click the 'Add' button. The 'IP Filter List' window appears.

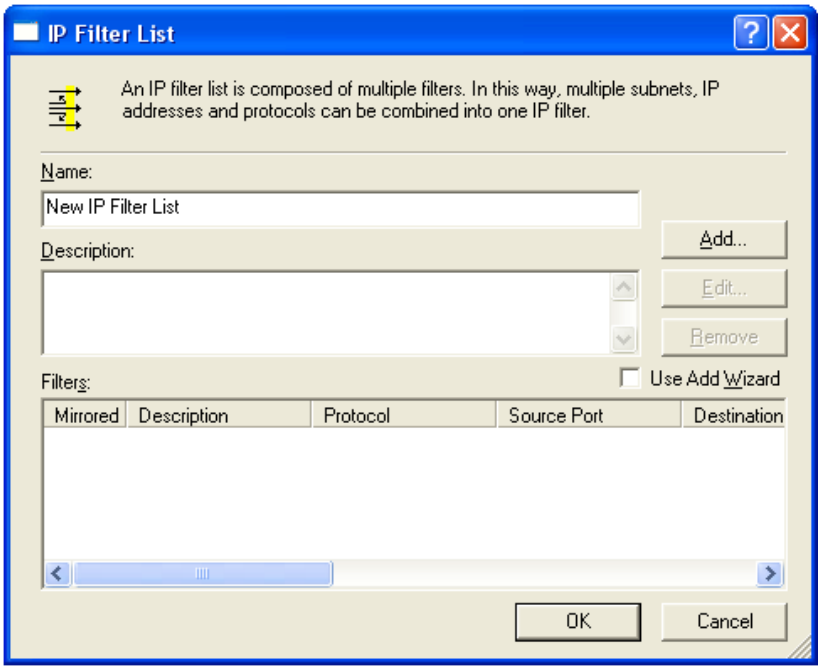

Figure 4.303 IP Filter List

d. Enter the name "Windows XP to OpenRG" for the filter list, and deselect the 'Use Add Wizard' check box. Then, click the 'Add' button. The 'Filter Properties' window appears.

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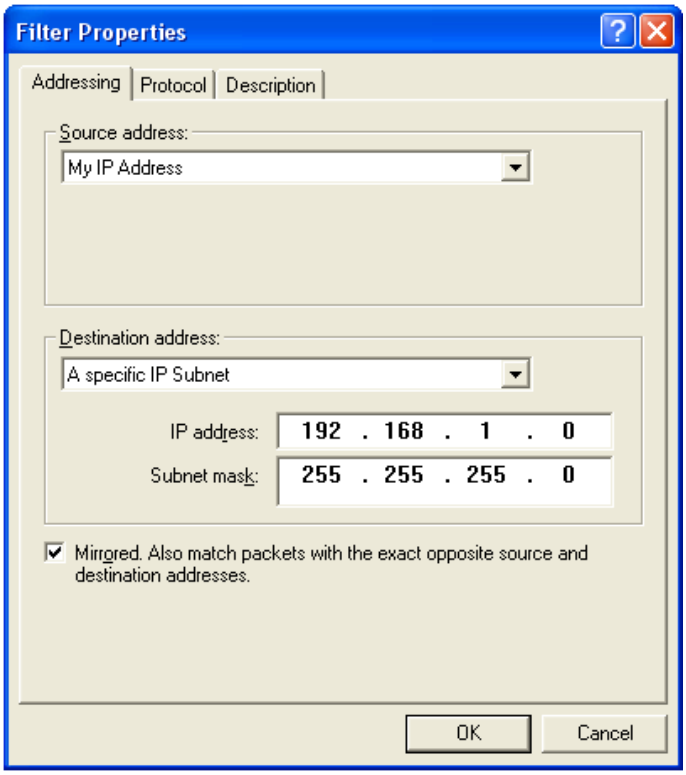

Figure 4.304 Filter Properties

e. In the 'Source address' drop-down menu, select 'My IP Address'.

f. In the 'Destination address' drop-down menu, select 'A Specific IP Subnet'. In the 'IP Address' field, enter the LAN Subnet (<openrg_lan_subnet>), and in the 'Subnet mask' field enter 255.255.255.0.

g. Click the 'Description' tab if you would like to enter a description for your filter.

h. Click the 'OK' button. Click 'OK' again in the 'IP Filter List' window to save the settings.

3. Building Filter List 2 – OpenRG to Windows XP:

a. Under the IP Filter List tab of the 'New Rule Properties' window, click the 'Add' button. The 'IP Filter List' window appears (see Figure 4.303).

b. Enter the name "OpenRG to Windows XP" for the filter list, deselect the 'Use Add Wizard' check box, and click the 'Add' button. The 'Filter Properties' window appears.

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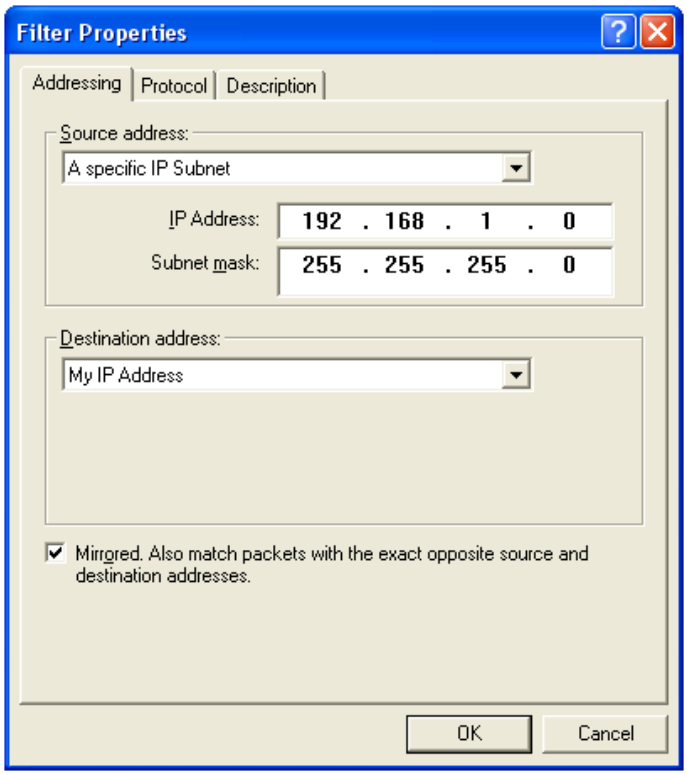

Figure 4.305 Filter Properties

c. In the 'Source address' drop-down menu, select 'A Specific IP Subnet'. In the 'IP Address' field enter the LAN Subnet (<openrg_lan_subnet>), and in the 'Subnet mask' field enter 255.255.255.0.

d. In the 'Destination address' drop-down menu, select 'My IP Address'.

e. Click the 'Description' tab if you would like to enter a description for your filter.

f. Click the 'OK' button. Click 'OK' again in the 'IP Filter List' window to save the settings.

4. Configuring Individual Rule of Tunnel 1 (Windows XP to OpenRG):

a. Under the 'IP Filter List' tab of the 'New Rule Properties' window, select the 'Windows XP to OpenRG' radio button.

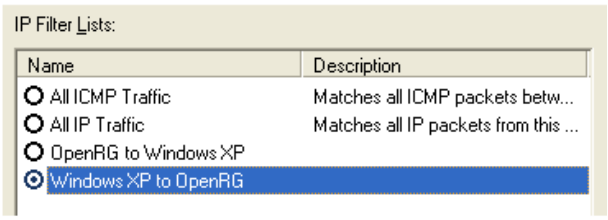

Figure 4.306 IP Filter List

b. Click the 'Filter Action' tab.

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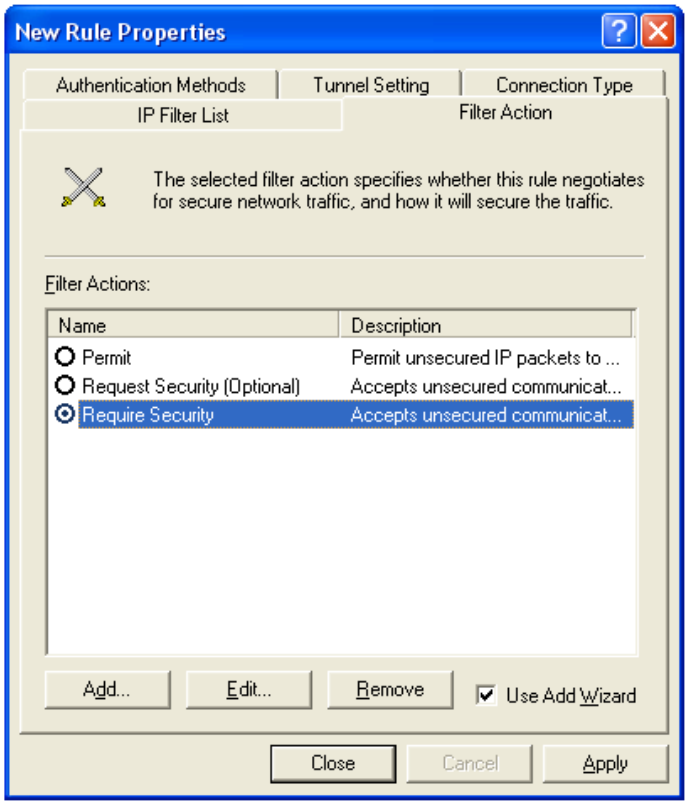

Figure 4.307 Filter Action

c. Select the 'Require Security' radio button, and click the 'Edit' button. The 'Require Security Properties' window appears.

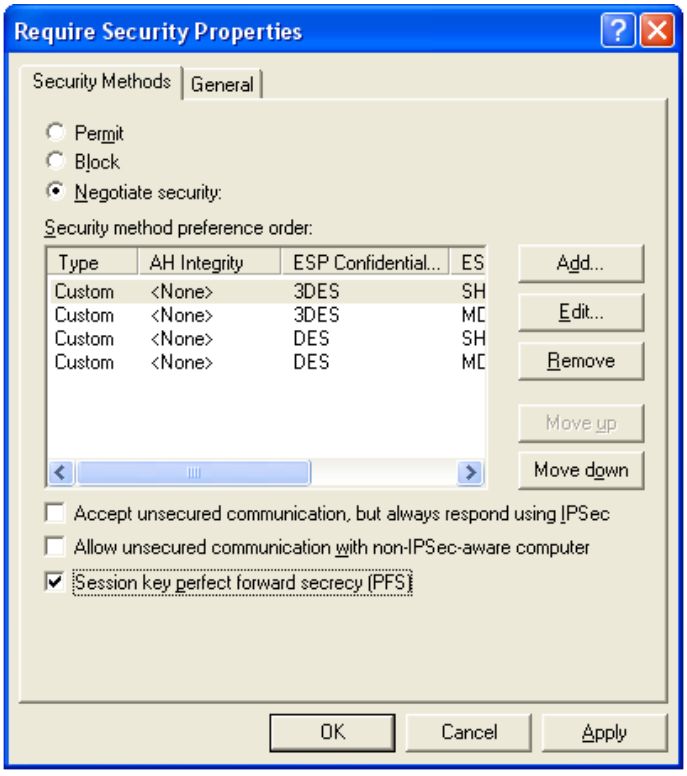

Figure 4.308 Require Security Properties

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d. Verify that the 'Negotiate security' option is enabled, and deselect the 'Accept unsecured communication, but always respond using IPSec' check box. Select the 'Session key Perfect Forward Secrecy (PFS)' (the PFS option must be enabled on OpenRG), and click the OK button.

e. Under the 'Authentication Methods' tab, click the Edit button. The 'Edit Authentication Method Properties' window appears.

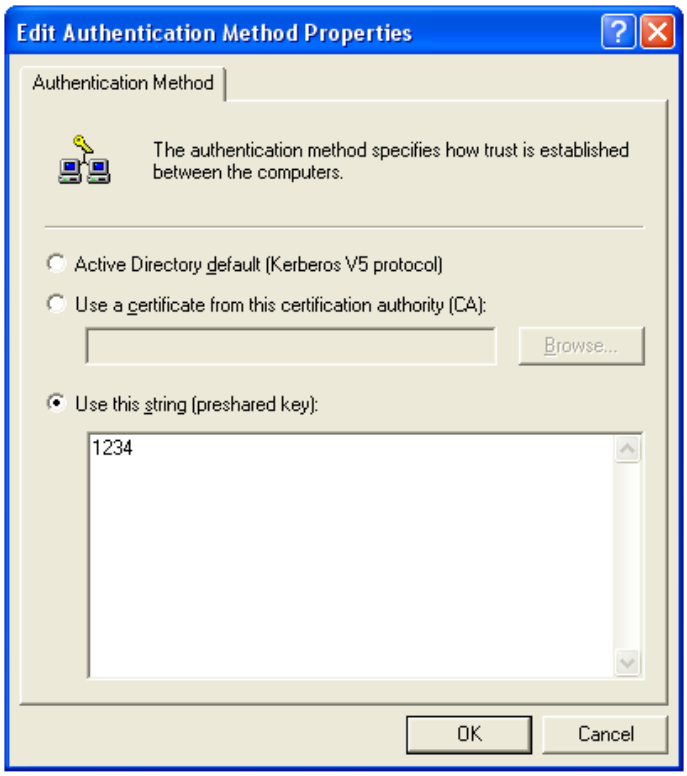
Edit Authentication Method Properties
Authentication Method
The authentication method specifies how trust is established between the computers.
Active Directory default (Kerberos V5 protocol)
Use a certificate from this certification authority (CA):
Browse...
Use this string (preshared key):
1234
OK
Cancel

Figure 4.309 Edit Authentication Method Properties

f. Select the 'Use this string (preshared key)' radio button, and enter a string that will be used as the key (for example, 1234). Click the 'OK' button.

g. Under the 'Tunnel Setting' tab, select the 'The tunnel endpoint is specified by this IP Address' radio button, and enter <openrg_wan_ip>.

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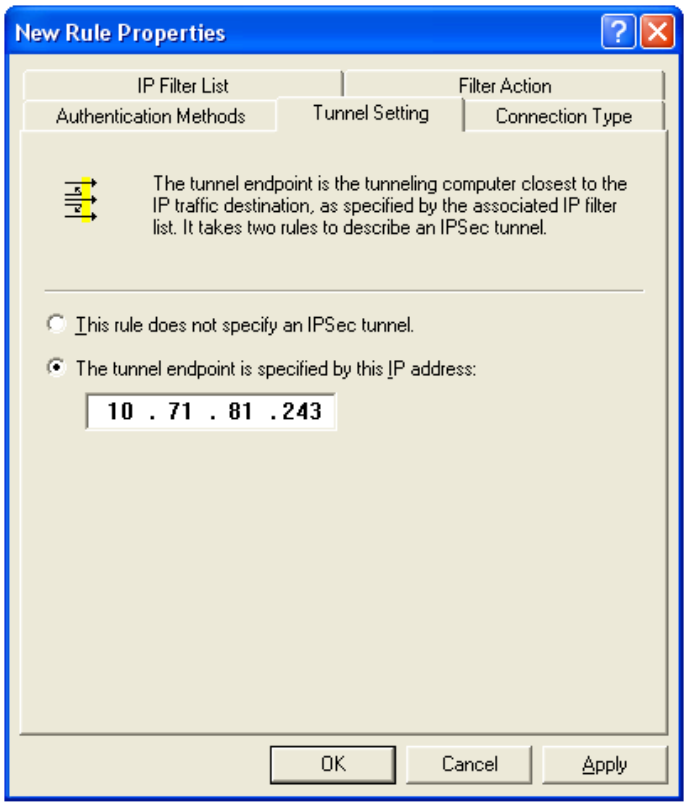
New Rule Properties
IP Filter List
Filter Action
Authentication Methods
Tunnel Setting
Connection Type
The tunnel endpoint is the tunneling computer closest to the IP traffic destination, as specified by the associated IP filter list. It takes two rules to describe an IPSec tunnel.
This rule does not specify an IPSec tunnel.
The tunnel endpoint is specified by this IP address:
10 . 71 . 81 .243
OK
Cancel
Apply

Figure 4.310 Tunnel Setting

h. Under the 'Connection Type' tab, verify that 'All network connections' is selected.

i. Click the 'Apply' button and then click the 'OK' button to save this rule.

5. Configuring Individual Rule of Tunnel 2 (OpenRG to Windows XP):

a. Under the 'IP Filter List' tab of the 'New Rule Properties' window, select the 'OpenRG to Windows XP' radio button.

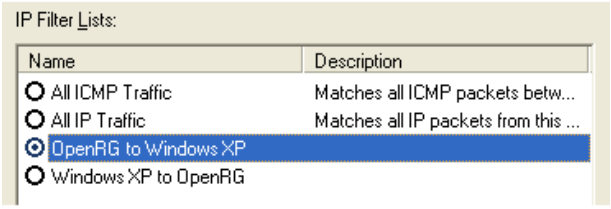

Figure 4.311 IP Filter List

b. Click the 'Filter Action' tab (see Figure 4.307).

c. Select the 'Require Security' radio button, and click the 'Edit' button. The 'Require Security Properties' window appears (see Figure 4.308).

d. Verify that the 'Negotiate security' option is enabled, and deselect the 'Accept unsecured communication, but always respond using IPSec' check box. Select the

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'Session key Perfect Forward Secrecy (PFS)' (the PFS option must be enabled on OpenRG), and click the OK button.

e. Under the 'Authentication Methods' tab, click the Edit button. The 'Edit Authentication Method Properties' window appears (see Figure 4.309).

f. Select the 'Use this string (preshared key)' radio button, and enter a string that will be used as the key (for example, 1234). Click the 'OK' button.

g. Under the 'Tunnel Setting' tab, select the 'The tunnel endpoint is specified by this IP Address' radio button, and enter <windows_ip>.

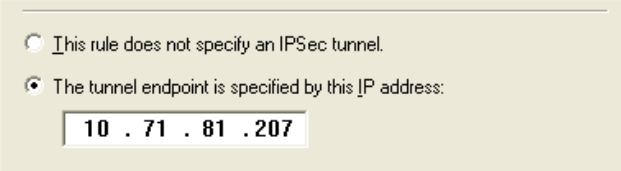

Figure 4.312 Tunnel Setting

h. Under the 'Connection Type' tab, verify that 'All network connections' is selected.

i. Click the 'Apply' button and then click the 'OK' button to save this rule.

j. Back on the 'OpenRG Connection Properties' window, note that the two new rules have been added to the 'IP Security rules' list.

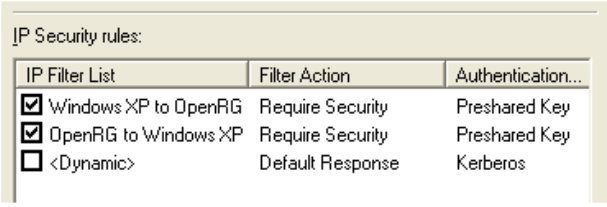

Figure 4.313 OpenRG Connection Properties

Click 'Close' to go back to the 'Local Security Settings' window (see Figure 4.296).

6. Assigning the New IPSec Policy: In the 'Local Security Settings' window, right-click the 'OpenRG Connection' policy, and select 'Assign'. A small green arrow will appear on the policy's folder icon and its status under the 'Policy Assigned' column will change to 'Yes'.

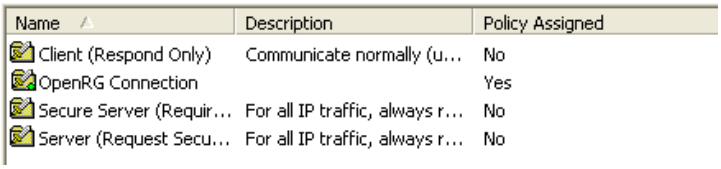

Figure 4.314 Local Security Settings

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4.11.1.5 IPSec Gateway-to-Gateway Connection Scenario

Establishing an IPSec tunnel between Gateways A and B creates a transparent and secure network for clients from subnets A and B, who can communicate with each other as if they were inside the same network.

This section describes how to create a gateway to gateway IPSec tunnel with the following authentication methods:

- **Pre-shared Secret** – Developed by the VPN Consortium (VPNC). OpenRG's VPN feature is VPNC certified.
- **RSA Signature** – A method using an RSA signature that is based on OpenRG's public key.
- **Peer Authentication of Certificates** – A method using a Certificate Authority (CA).

This section describes the network configuration of both gateways, followed by the IPSec tunnel setup methods. The configurations of both gateways are identical, except for their IP addresses and the use of these addresses when creating the tunnel—the default gateway address of each gateway should be the WAN IP address of the other gateway.

Note: This section describes the configuration of Gateway A only. The same configuration must be performed on Gateway B, with the exceptions that appear in the note admonitions.

The following figure describes the IPSec tunnel setup, and contains all the IP addresses involved. Use it as a reference when configuring your gateways.

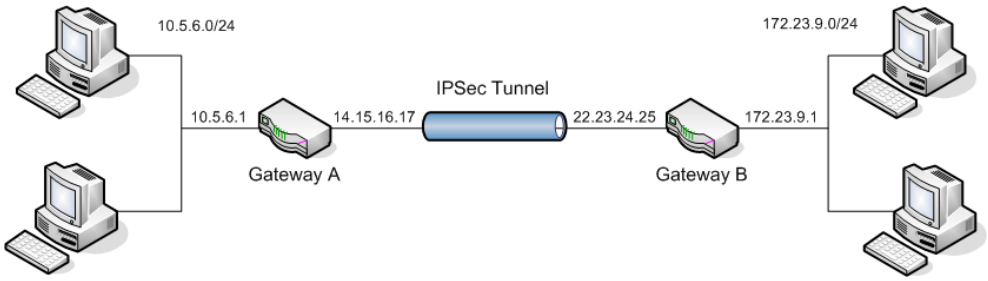

Figure 4.315 Configuration Diagram

4.11.1.5.1 Network Configuration

Before you can set up an IPSec connection, you must configure both of the gateways' LAN and WAN interface settings. This example contains specific IP addresses, which you can either use or substitute with your own.

- LAN Interface Settings

1. Under the 'System' tab, click the 'Network Connections' menu item. The 'Network Connections' screen appears.

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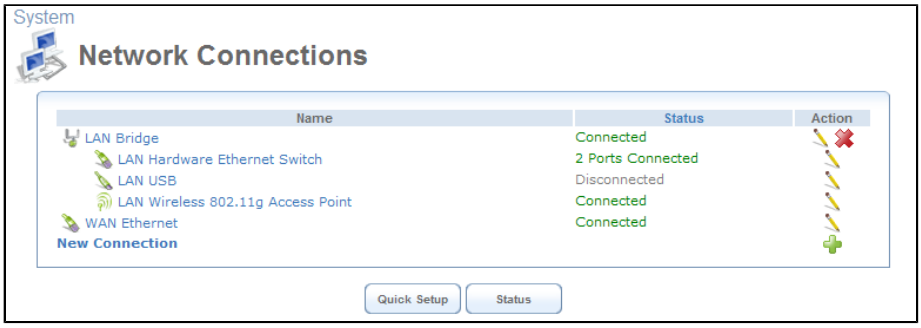

Figure 4.316 Network Connections

2. If your LAN Ethernet connection is bridged, click the 'LAN Bridge' link (as depicted in this example). Otherwise, click the 'LAN Ethernet' link (or the 'LAN Hardware Ethernet Switch' link, depending on your platform). The 'LAN Bridge Properties' screen appears.

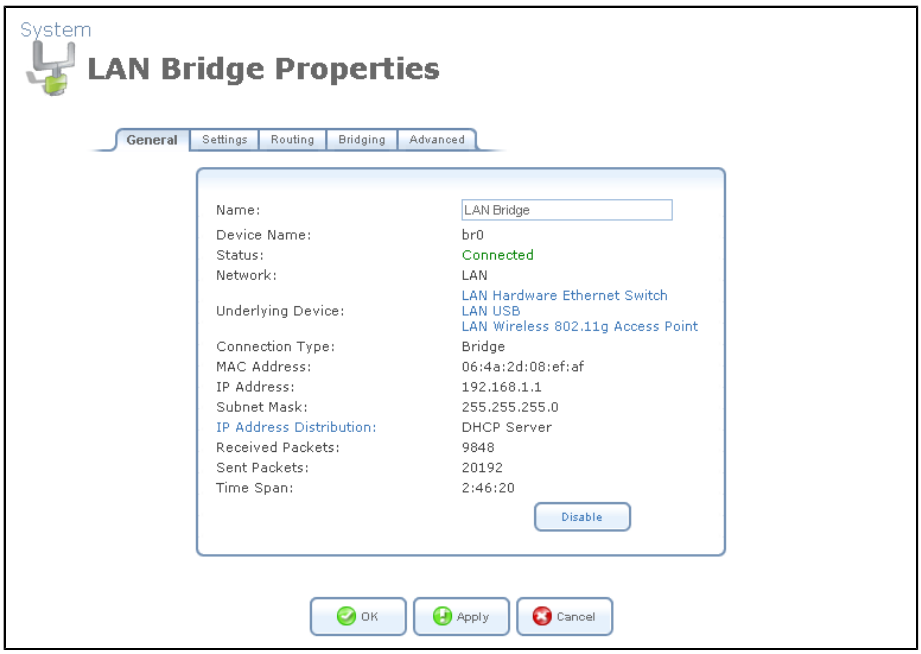

Figure 4.317 LAN Bridge Properties – General

3. Press the 'Settings' tab, and configure the following settings:

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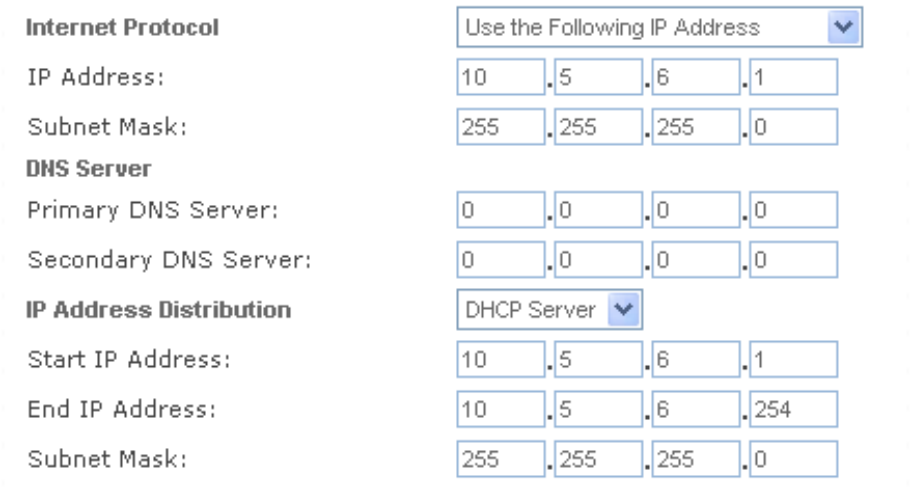
Internet Protocol
Use the Following IP Address
IP Address:
10 . 5 . 6 . 1
Subnet Mask:
255 . 255 . 255 . 0
DNS Server
Primary DNS Server:
0 . 0 . 0 . 0
Secondary DNS Server:
0 . 0 . 0 . 0
IP Address Distribution
DHCP Server
Start IP Address:
10 . 5 . 6 . 1
End IP Address:
10 . 5 . 6 . 254
Subnet Mask:
255 . 255 . 255 . 0

Figure 4.318 LAN Bridge Properties – Settings

Internet Protocol Select "Use the Following IP Address"

IP Address Specify 10.5.6.1

Subnet Mask Specify 255.255.255.0

IP Address Distribution Select "DHCP Server"

Start IP Address Specify 10.5.6.1

End IP Address Specify 10.5.6.254

Subnet Mask Specify 255.255.255.0

Note: When configuring Gateway B, the IP address should be 172.23.9.1, according to the example depicted here.

4. Click 'OK' to save the settings.

- WAN Interface Settings

1. Under the 'System' tab, click the 'Network Connections' menu item. The 'Network Connections' screen appears.

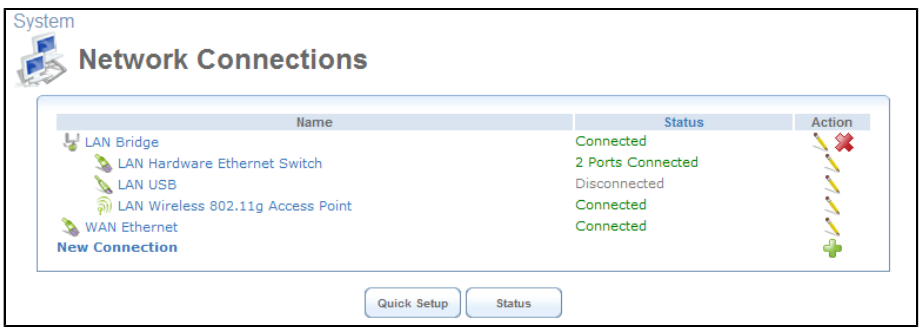

Figure 4.319 Network Connections

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2. Click the 'WAN Ethernet' link, the 'WAN Ethernet Properties' screen appears.

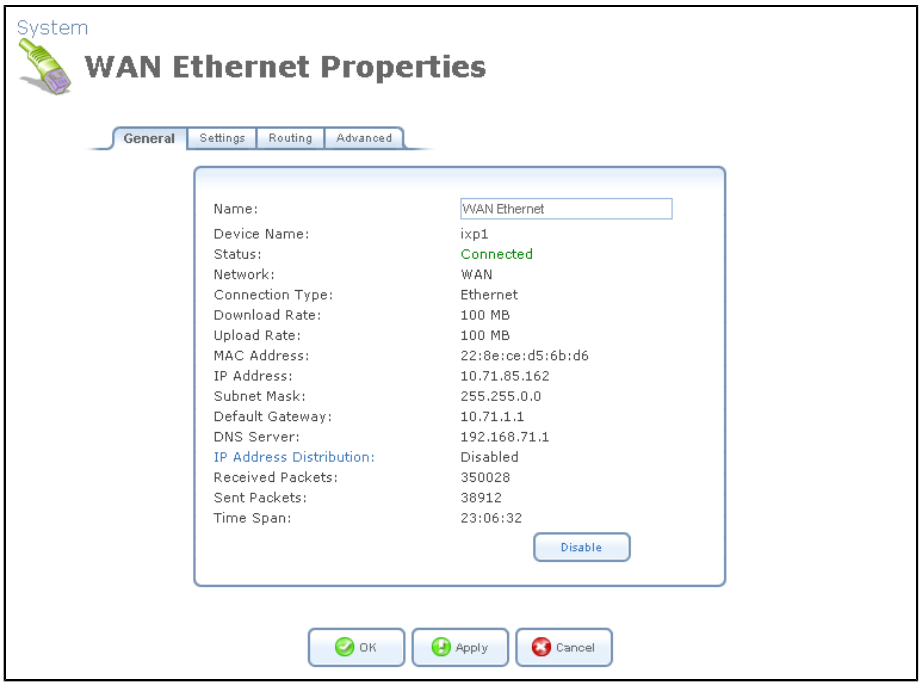

Figure 4.320 WAN Ethernet Properties – General

3. Press the 'Settings' tab, and configure the following settings:

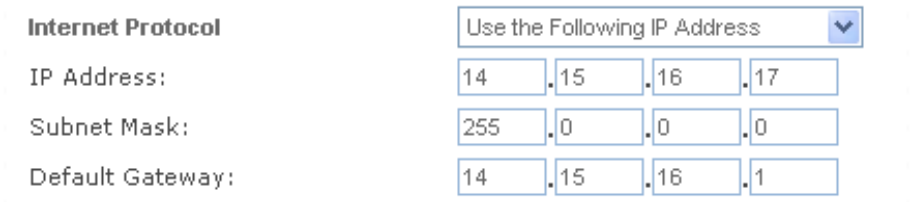

Figure 4.321 WAN Ethernet Properties – Settings

Internet Protocol Select "Use the Following IP Address"

IP Address Specify 14.15.16.17

Subnet Mask Specify the appropriate subnet mask, i.e 255.0.0.0

Default Gateway Specify the appropriate Default Gateway in order to enable IP routing, i.e 14.15.16.1

Note: When configuring Gateway B, the IP address should be 22.23.24.25, and the default gateway 22.23.24.1, according to the example depicted here.

4. Click 'OK' to save the settings.

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4.11.1.5.2 Gateway-to-Gateway with Pre-shared Secrets

A typical gateway-to-gateway VPN uses a pre-shared secret for authentication. Gateway A connects its internal LAN 10.5.6.0/24 to the Internet. Gateway A's LAN interface has the address 10.5.6.1, and its WAN (Internet) interface has the address 14.15.16.17. Gateway B connects the internal LAN 172.23.9.0/24 to the Internet. Gateway B's WAN (Internet) interface has the address 22.23.24.25. The Internet Key Exchange (IKE) Phase 1 parameters used are:

- Main mode
- 3DES (Triple DES)
- SHA-1
- MODP group 2 (1024 bits)
- Pre-shared secret of "hr5x"
- SA lifetime of 28800 seconds (eight hours) with no Kbytes re-keying

The IKE Phase 2 parameters used are:

- 3DES (Triple DES)
- SHA-1
- ESP tunnel mode
- MODP group 2 (1024 bits)
- Perfect forward secrecy for re-keying
- SA lifetime of 3600 seconds (one hour) with no Kbytes re-keying
- Selectors for all IP protocols, all ports, between 10.5.6.0/24 and 172.23.9.0/24, using IPv4 subnets

To set up Gateway A for this scenario, follow these steps:

1. Under the 'System' tab, click the 'Network Connections' menu item. The 'Network Connections' screen appears.

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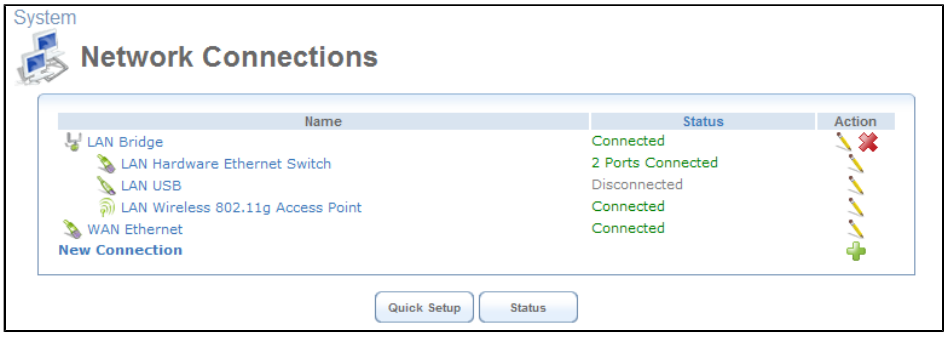

Figure 4.322 Network Connections

2. Click the 'New Connection' link. The 'Connection Wizard' screen appears.

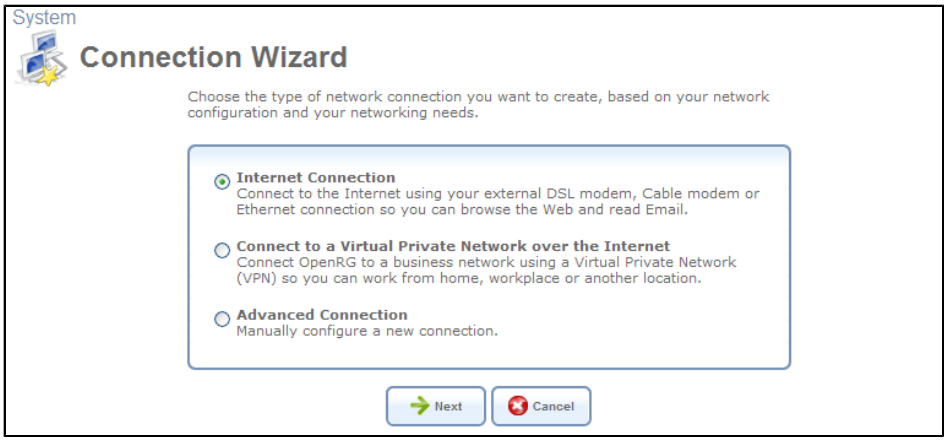
System
Connection Wizard
Choose the type of network connection you want to create, based on your network configuration and your networking needs.
Internet Connection
Connect to the Internet using your external DSL modem, Cable modem or Ethernet connection so you can browse the Web and read Email.
Connect to a Virtual Private Network over the Internet
Connect OpenRG to a business network using a Virtual Private Network (VPN) so you can work from home, workplace or another location.
Advanced Connection
Manually configure a new connection.
Next
Cancel

Figure 4.323 Connection Wizard

3. Select the 'Connect to a Virtual Private Network over the Internet' radio button and click 'Next'. The 'Connect to a Virtual Private Network over the Internet' screen appears.

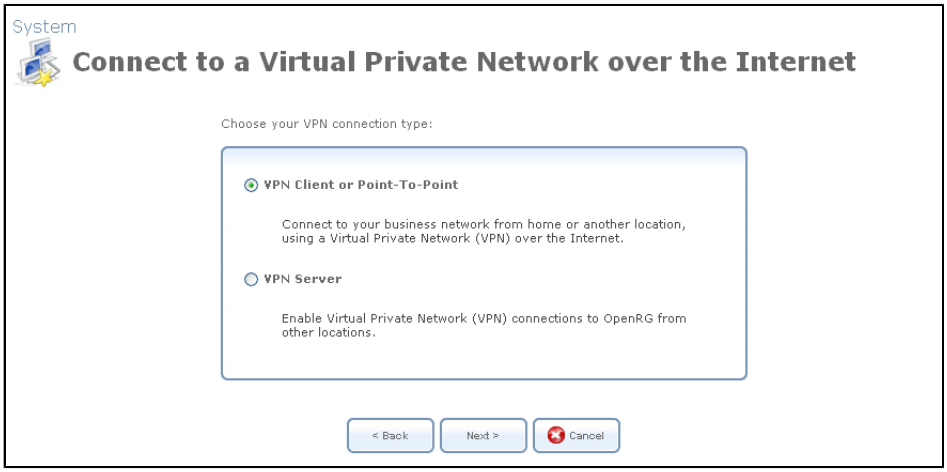
System
Connect to a Virtual Private Network over the Internet
Choose your VPN connection type:
VPN Client or Point-To-Point
Connect to your business network from home or another location, using a Virtual Private Network (VPN) over the Internet.
VPN Server
Enable Virtual Private Network (VPN) connections to OpenRG from other locations.
< Back
Next >
Cancel

Figure 4.324 Connect to a Virtual Private Network over the Internet

4. Select the 'VPN Client or Point-To-Point' radio button and click 'Next'. The 'VPN Client or Point-To-Point' screen appears.

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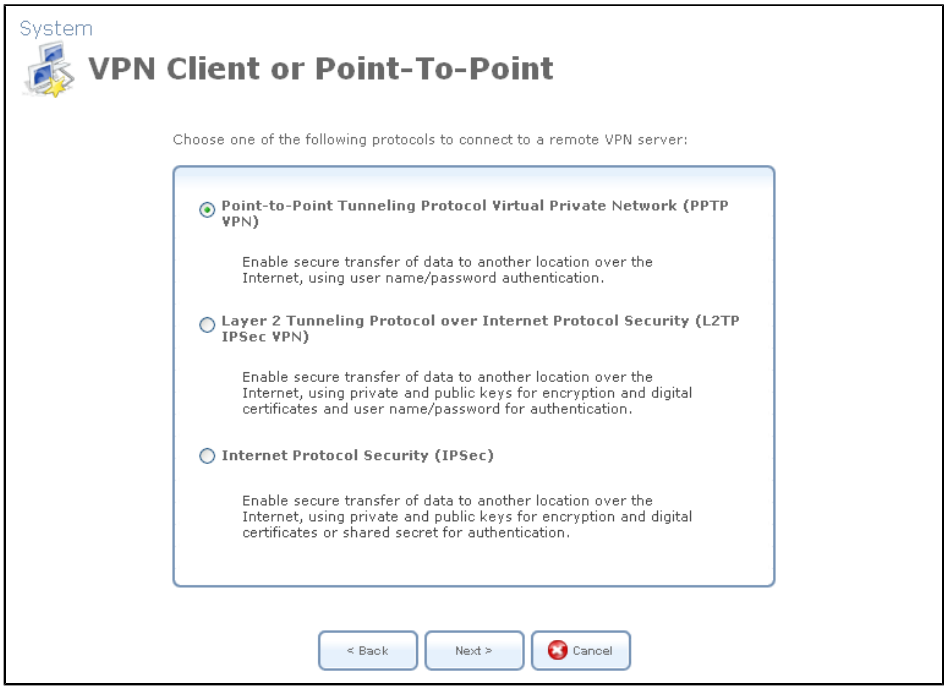
System
VPN Client or Point-To-Point
Choose one of the following protocols to connect to a remote VPN server:
Point-to-Point Tunneling Protocol Virtual Private Network (PPTP VPN)
Enable secure transfer of data to another location over the Internet, using user name/password authentication.
Layer 2 Tunneling Protocol over Internet Protocol Security (L2TP IPSec VPN)
Enable secure transfer of data to another location over the Internet, using private and public keys for encryption and digital certificates and user name/password for authentication.
Internet Protocol Security (IPSec)
Enable secure transfer of data to another location over the Internet, using private and public keys for encryption and digital certificates or shared secret for authentication.
< Back
Next >
Cancel

Figure 4.325 VPN Client or Point-To-Point

5. Select the 'Internet Protocol Security (IPSec)' radio button and click 'Next'. The 'Internet Protocol Security (IPSec)' screen appears.

Figure 4.326 Internet Protocol Security (IPSec)

6. Specify the following parameters, as depicted in Figure 4.327.

   Host Name or IP Address of Destination Gateway Specify 22.23.24.25

   Remote IP Select "IP Subnet"

   Remote Subnet IP Address Specify 172.23.9.0

   Remote Subnet Mask Specify 255.255.255.0

   Shared Secret Specify "hr5x"

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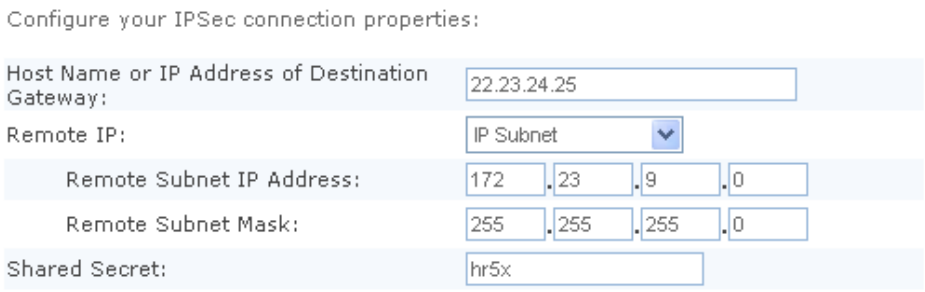

Figure 4.327 Internet Protocol Security (IPSec)

Note: When configuring Gateway B, the IP Address of Destination Gateway should be 14.15.16.17, and the Remote Subnet IP Address should be 10.5.6.0, according to the example depicted here.

7. Click 'Next', the 'Connection Summary' screen appears.

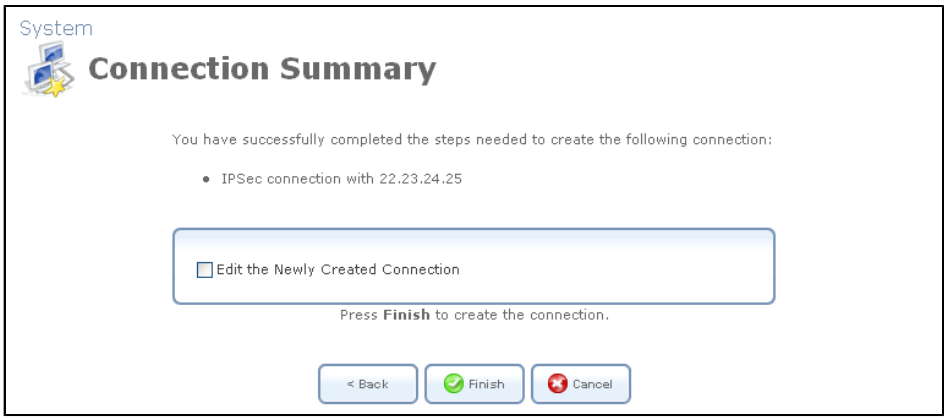

Figure 4.328 Connection Summary

8. Select the 'Edit the Newly Created Connection' check box, and click 'Finish'. The 'VPN IPSec Properties' screen appears, displaying the 'General' tab.

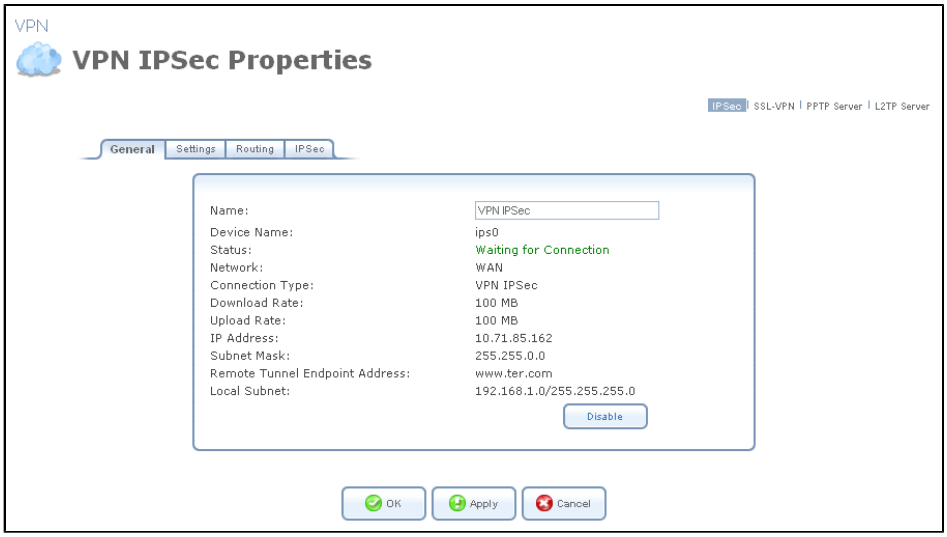

Figure 4.329 VPN IPSec Properties – General

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9. Click the 'IPSec' tab, and configure the following settings:
   - Deselect the 'Compress' check box.
   - Under 'Hash Algorithm', deselect the 'Allow Peers to Use MD5' check box.
   - Under 'Group Description Attribute', deselect the 'DH Group 5 (1536 bit)' check box.
   - Under 'Encryption Algorithm', deselect the 'Allow AH Protocol (No Encryption)' check box.
10. Click 'OK' to save the settings.

Perform the same procedure on Gateway B with its respective parameters. When done, the IPSec connection's status should change to "Connected".

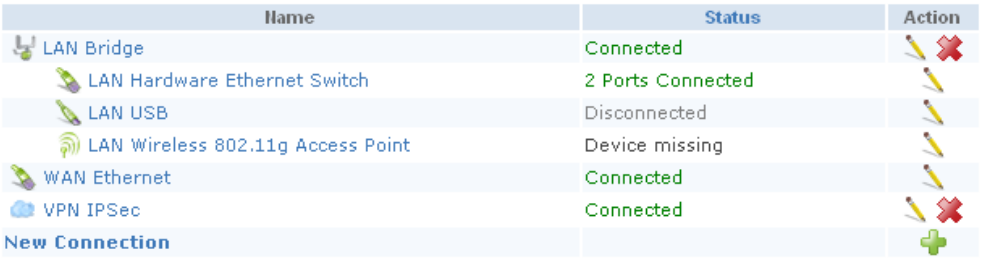

Figure 4.330 Connected VPN IPSec Connection

4.11.1.5.3 Gateway-to-Gateway with an RSA Signature

The RSA signature, which is part of the RSA encryption mechanism, is an additional method available on OpenRG for providing peer authentication in a VPN IPSec connection. The RSA signature can be created in OpenRG on the basis of its public key. When using this method, the two gateways must be configured with each other's RSA signature, as further explained in this section.

To enable the gateway-to-gateway VPN IPSec connection using the RSA signature, perform the following:

1. Create a VPN IPSec connection on each gateway as described in Section 4.11.1.5.2.
2. In OpenRG **A**, go to the 'Advanced' screen, and click the 'IPSec' icon. The 'Internet Protocol Security (IPSec)' screen appears.

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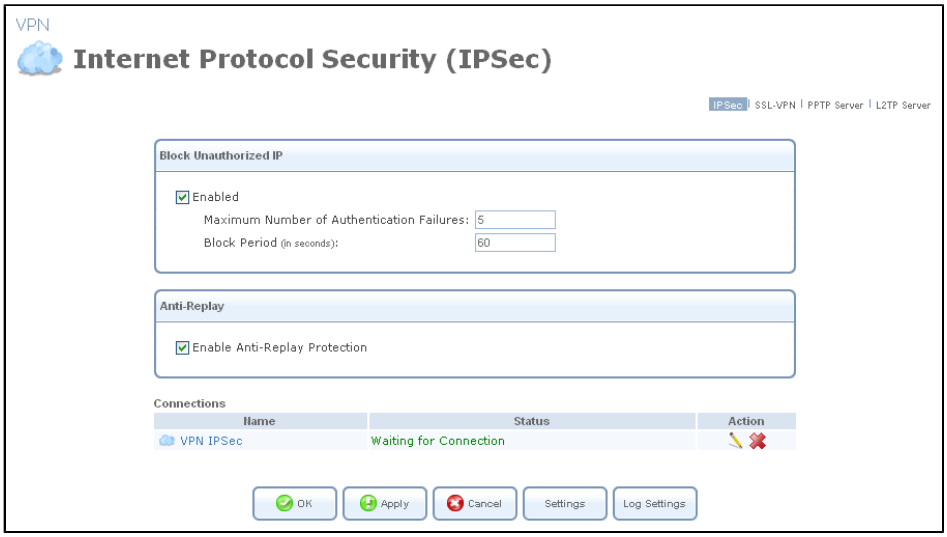

Figure 4.331 Internet Protocol Security (IPSec)

3. Click the 'Settings' button. The 'Internet Protocol Security (IPSec) Settings' screen appears, displaying OpenRG's public key.

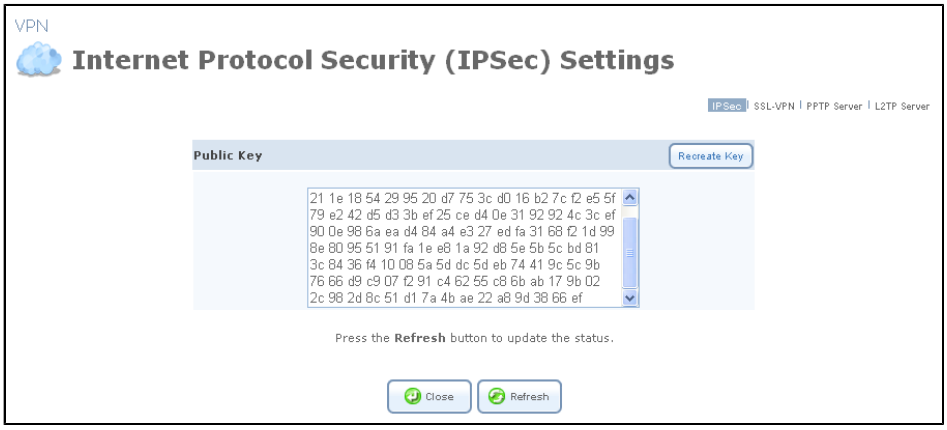
VPN
Internet Protocol Security (IPSec) Settings
IPSec | SSL-VPN | PPTP Server | L2TP Server
Public Key
Recreate Key
21 1e 18 54 29 95 20 d7 75 3c d0 16 b2 7c f2 e5 5f
79 e2 42 d5 d3 3b ef 25 ce d4 0e 31 92 92 4c 3c ef
90 0e 98 6a ea d4 84 a4 e3 27 ed fa 31 68 f2 1d 99
8e 80 95 51 91 fa 1e e8 1a 92 d8 5e 5b 5c bd 81
3c 84 36 f4 10 08 5a 5d dc 5d eb 74 41 9c 5c 9b
76 66 d9 c9 07 f2 91 c4 62 55 c8 6b ab 17 9b 02
2c 98 2d 8c 51 d1 7a 4b ae 22 a8 9d 38 66 ef
Press the Refresh button to update the status.
Close
Refresh

Figure 4.332 Internet Protocol Security (IPSec) Settings

4. Copy the public key and paste it into a text editor.

5. Remove all spaces from the public key so that it will appear as one string.

6. In OpenRG **B**, click the 'VPN' menu item under the 'Services' tab. The 'Internet Protocol Security (IPSec)' screen appears, displaying the VPN IPSec connection you have created (see Figure 4.331).

7. Click the connection's action icon , and select the 'IPSec' sub-tab of the 'VPN IPSec Properties' screen that appears (see Figure 4.329).

8. From the 'Peer Authentication' drop-down menu, select the 'RSA Signature' option. The screen refreshes, displaying the 'RSA Signature' text field.

9. In the text field, type **0x** and paste the public key string from the text editor.

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10. Repeat the same procedure for configuring OpenRG **A** with the RSA signature of OpenRG **B**. When done, the IPSec connection's status on both gateways should change to 'Connected'.

4.11.1.5.4 Gateway-to-Gateway with Certificate-based Peer Authentication

An additional authentication method for a gateway-to-gateway VPN is peer authentication of certificates. Authentication is performed when each gateway presents a certificate, signed by a mutually agreed upon Certificate Authority (CA), to the other gateway.

For testing purposes, Linux provides a mechanism for creating self-signed certificates, thus eliminating the need to acquire them from the CA. This section provides a description for this procedure, after which you will be able to use these certificates for authentication of the gateway-to-gateway VPN connection.

To create a self-signed certificate, perform the following:

1. Running as root, install the OpenSSL Debian package:
```
# apt-get install openssl
```
2. Switch back to a regular user, and create a directory for the certificates:
```
$ cd ~
$ mkdir cert_create
$ cd cert_create/
```
3. Use the Linux 'CA.sh' utility. Note that only the required fields are listed below. For the rest, you may simply press Enter.
```
$ /usr/lib/ssl/misc/CA.sh -newca
    Enter PEM pass phrase: <enter a password>
    Common Name: <enter your CA name>
    Enter pass phrase for ./demoCA/private/./cakey.pem: <enter a password>
```
For more information about this script, run 'man CA.pl' (CA.pl and CA.sh are the same).
4. Copy the certificates from the **/demoCA** directory under which they were created, providing them with your CA name.
```
$ cp demoCA/cacert.pem <your CA name>_cacert.pem
$ cp demoCA/careq.pem <your CA name>_careq.pem
```
5. Load the new certificates to both gateways:
    a. Browse to the 'Advanced' tab and click the 'Certificates' icon.
    b. Select the 'CA's' sub-tab and click 'Upload Certificate'. The 'Load CA's Certificate' screen appears.
    c. Browse for the location of the certificate, which is **~/cert_create/<your CA name>_cacert.pem**, and click 'Upload'.

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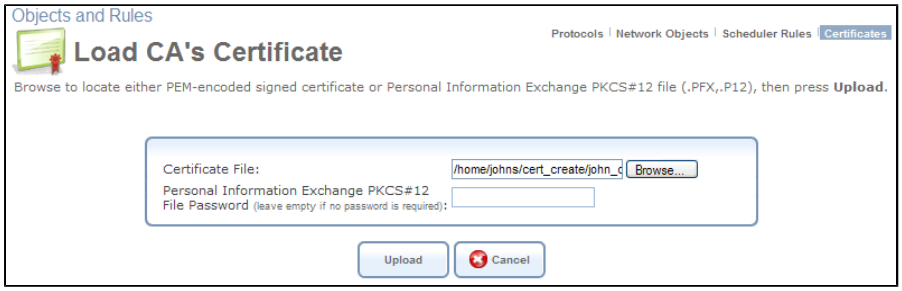
Objects and Rules
Load CA's Certificate
Protocols | Network Objects | Scheduler Rules | Certificates
Browse to locate either PEM-encoded signed certificate or Personal Information Exchange PKCS#12 file (.PFX,.P12), then press Upload.
Certificate File:
/home/johns/cert_create/john_c
Browse...
Personal Information Exchange PKCS#12 File Password (leave empty if no password is required):
Upload
Cancel

Figure 4.333 Load CA's Certificate

6. Generate a certificate request from both gateways:

   a. Browse to the 'Advanced' tab and click the 'Certificates' icon.

   b. In the 'OpenRG's Local' sub-tab, click 'Create Certificate Request'. The 'Create X509 Request' screen appears.

   c. In the 'Certificate Name' field, enter "OpenRG-1" (and "OpenRG-2" on the other gateway, respectively).

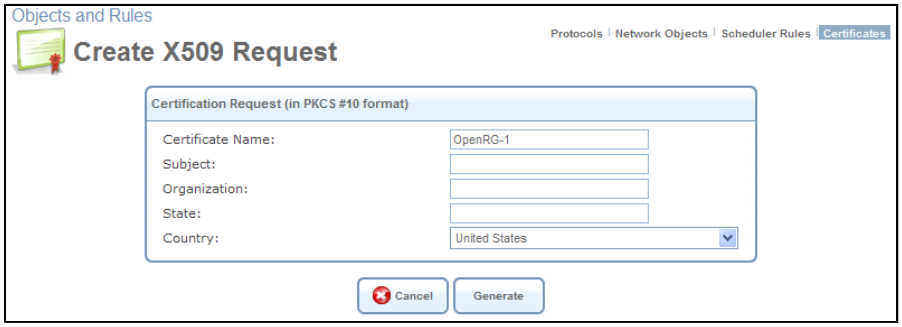

Figure 4.334 Create X509 Request

   d. Click 'Generate' and then 'Refresh'. The 'New X509 Request' screen appears.

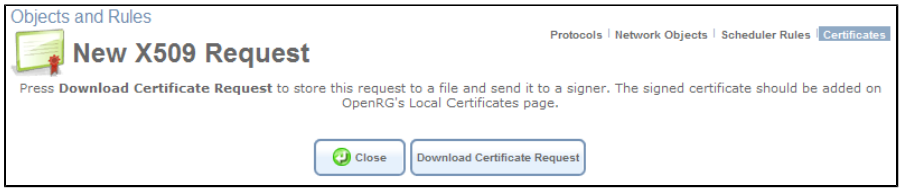
Objects and Rules
New X509 Request
Protocols | Network Objects | Scheduler Rules | Certificates
Press Download Certificate Request to store this request to a file and send it to a signer. The signed certificate should be added on OpenRG's Local Certificates page.
Close
Download Certificate Request

Figure 4.335 New X509 Request

   e. Click 'Download Certificate Request', and save the file under **~/cert_create/OpenRG-1/2_OpenRG.csr**.

> Note: Do not delete the empty certificate that now appears under the 'OpenRG's Local' sub-tab, as this is the request itself. If you delete it, the certificate will not be accepted by OpenRG.

7. Sign the certificate request using the 'CA.sh' script on both gateways:

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```
$ mv <OpenRG-1>.csr newreq.pem
$ /usr/lib/ssl/misc/CA.sh -sign
    Enter pass phrase for ./demoCA/private/cakey.pem: <enter a password>
    Sign the certificate? [y/n]: <choose y>
    1 out of 1 certificate requests certified, commit? [y/n] <choose y>
$ mv newcert.pem <OpenRG-1>_newcert.pem
$ mv newreq.pem <OpenRG-1>_newreq.pem

<Repeat the above for OpenRG-2>
```

8. Load the certificates to both gateways:

   a. Browse to the 'Advanced' tab and click the 'Certificates' icon.

   b. In the 'OpenRG's Local' sub-tab, click 'Upload Certificate'. The 'Load OpenRG's Local Certificate' screen appears.

   c. Browse to the location of the certificate, which is **~/cert_create/<OpenRG-1/2>_newcert.pem**, and click 'Upload'.

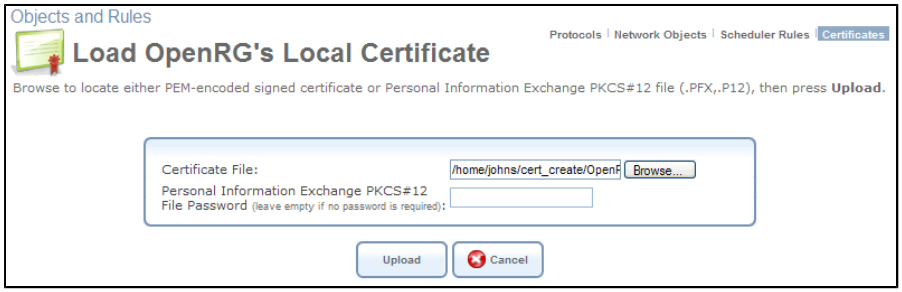
Objects and Rules
Load OpenRG's Local Certificate
Protocols | Network Objects | Scheduler Rules | Certificates
Browse to locate either PEM-encoded signed certificate or Personal Information Exchange PKCS#12 file (.PFX,.P12), then press Upload.
Certificate File:
/home/johns/cert_create/OpenR
Browse...
Personal Information Exchange PKCS#12 File Password (leave empty if no password is required):
Upload
Cancel

Figure 4.336 Load OpenRG's Local Certificate

To authenticate the VPN connection with the created certificates, perform the following:

1. Click the 'VPN IPSec' link in the 'Network Connections' screen, and then click the 'IPSec' sub-tab.

2. In the 'IPSec Automatic Phase 1' section, in the 'Peer Authentication' drop-down menu, select "Certificate". The screen refreshes, providing additional settings.

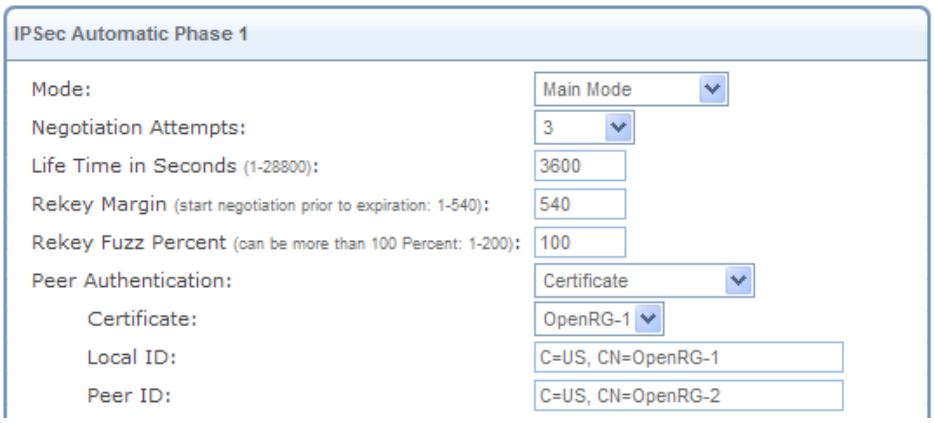

Figure 4.337 VPN IPSec Properties

3. In the 'Certificate' drop-down menu, select Gateway A's newly added certificate.

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4. In the 'Local ID' field, enter Gateway A's certificate details. You can copy these details from the 'Certificates' screen under the 'Advanced' tab. Click the certificate and copy the details from the subject field, for example "C=US, CN=OpenRG-1".

5. In the 'Peer ID' field, enter Gateway B's certificate details, for example "C=US, CN=OpenRG-2".

6. Click 'OK' to save the settings.

Perform the same procedure on Gateway B with its respective parameters. When done, the IPSec connection's status should change to "Connected".

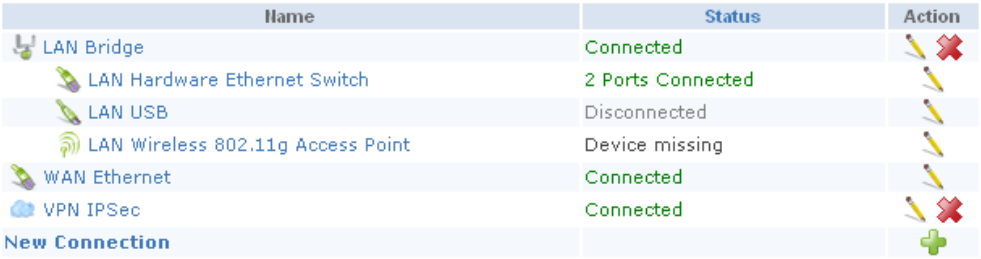

Figure 4.338 Connected VPN IPSec Connection

4.11.2 Secure Socket Layer VPN

Secure Socket Layer Virtual Private Network (SSL VPN) provides simple and secure remote access to home and office network resources. It provides the security level of IPSec, but with the simplicity of using a standard Web browser. The unparalleled advantage of SSL VPN is its zero-configuration on the client's end. Remote users can simply browse to OpenRG from any computer in the world and run applications on its LAN computers. However, since SSL VPN is not a tunnel such as PPTP or IPSec, only pre-defined applications may be used. When using this feature, non-administrator remote users browsing to OpenRG will be routed to the "SSL VPN Portal". This portal will present them each with their list of applications.

Note: The only requirement for the client computer is the availability of Java Runtime Environment (JRE), which is mandatory for using this feature. Use the "Click here" link at the bottom of the SSL VPN portal screen to install this environment, or visit http://www.sun.com.

4.11.2.1 Using SSL VPN – the Remote Desktop Example

This section demonstrates setting up a Remote Desktop (RDP) application over SSL VPN in order to remotely connect and control a computer inside OpenRG's LAN. This consists of two stages—creating a remote desktop global shortcut, and launching the application from a remote computer via the SSL VPN portal.

4.11.2.1.1 Creating a Global Shortcut

To create an RDP shortcut, perform the following:

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1. Access the Secure Socket Layer VPN (SSL VPN) settings either from its link under the 'VPN' menu item of the 'Services' screen, or by clicking the 'SSL VPN' icon in the 'Advanced' screen. The 'SSL VPN' screen appears.

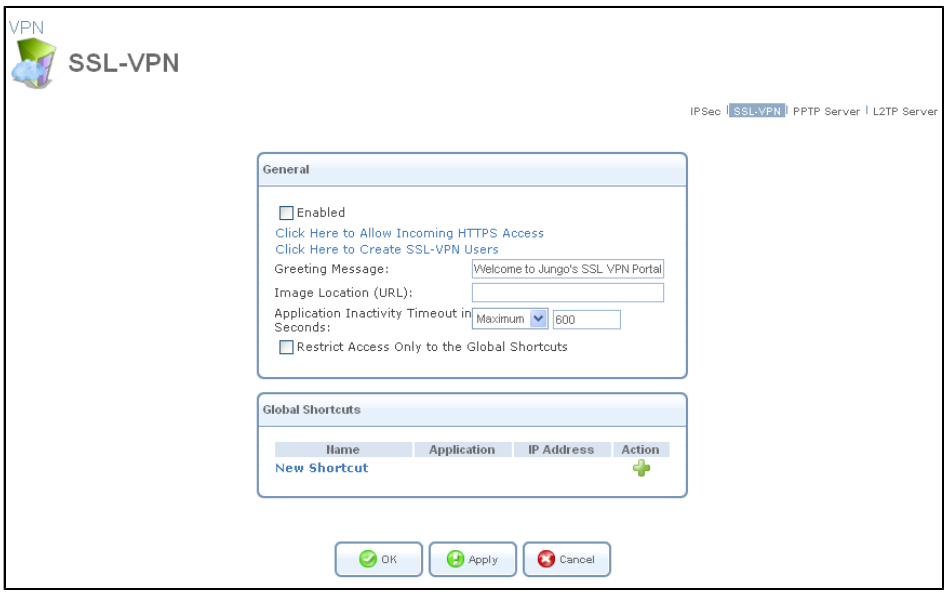

Figure 4.339 SSL VPN

2. To enable SSL VPN, select the 'Enabled' check box, and click 'Apply'. The screen refreshes, adding a link to the SSL VPN Portal.

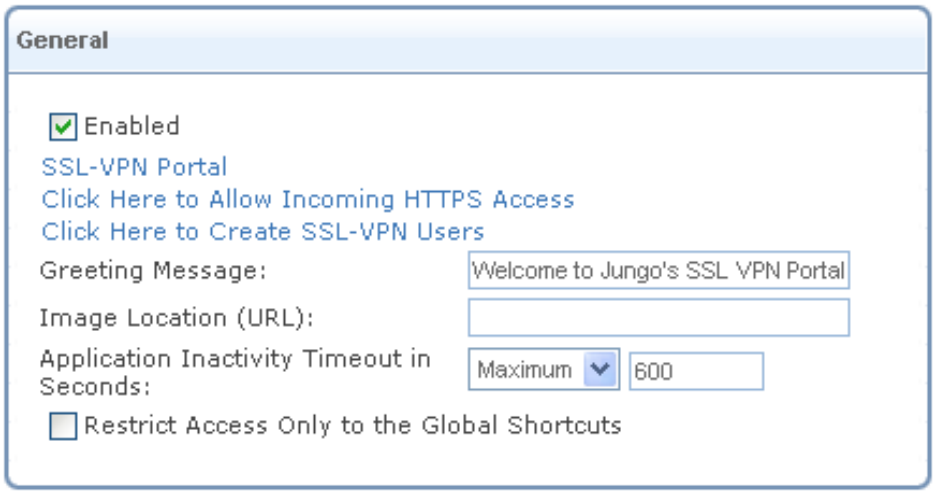

Figure 4.340 Enabled SSL VPN

This link opens the SSL-VPN portal that remote users will access when browsing to OpenRG, as described in Section 4.11.2.3.

3. Click the 'Click Here to Allow Incoming HTTPS Access' link. The 'Remote Administration' screen appears (for more information, refer to Section 5.4.3). In the 'Allow Incoming WAN Access to Web-Management' section, select both HTTPS port 443 and 8443, and click 'OK'.

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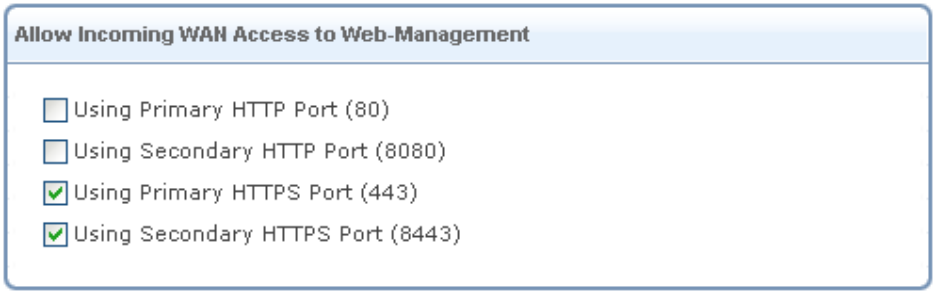
Allow Incoming WAN Access to Web-Management
Using Primary HTTP Port (80)
Using Secondary HTTP Port (8080)
Using Primary HTTPS Port (443)
Using Secondary HTTPS Port (8443)

Figure 4.341 Remote Administration Ports

4. Back in the 'SSL VPN' screen, click the 'Click Here to Create SSL-VPN Users' link. The 'Users' screen appears, where you can define a user with the 'Remote Access by SSL VPN' option enabled. Refer to Section 5.3 to learn how to define and configure users. You can specify a group of users in the same manner.

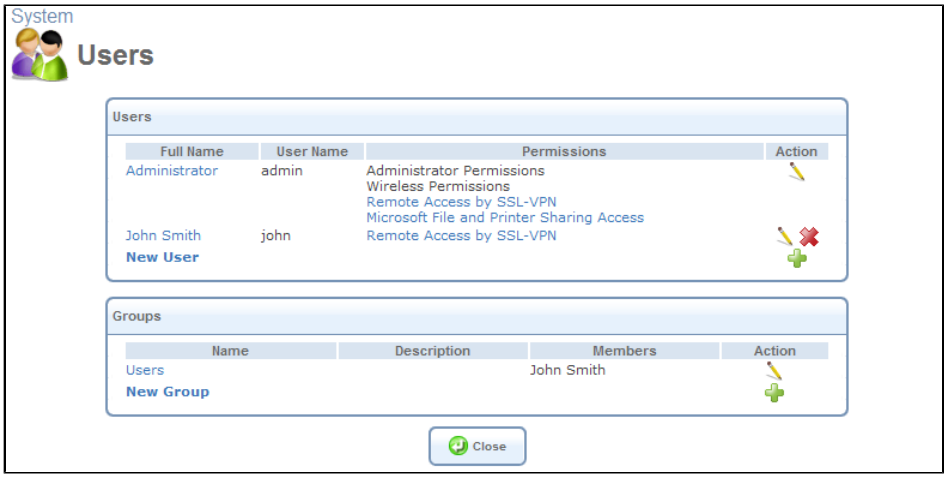

Figure 4.342 New User

Click 'Close' when done.

5. In the 'SSL VPN' screen, click the 'New Shortcut' link. The 'Shortcut Wizard' screen appears.

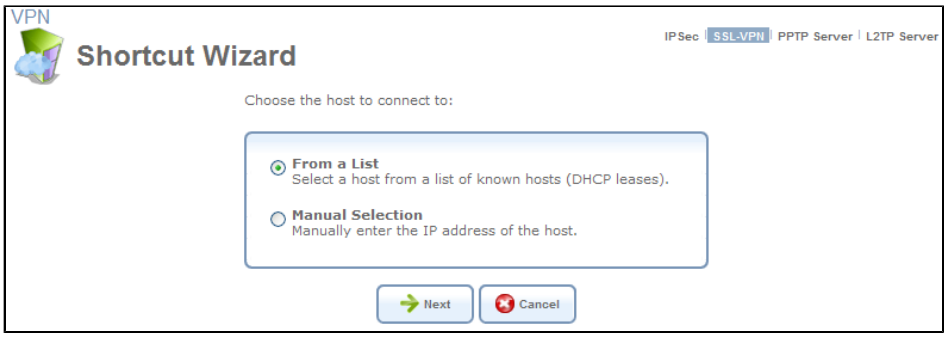

Figure 4.343 New Shortcut

6. Choose whether to select a host from a given list, comprised of DHCP leases that are known to OpenRG, or to manually enter the host's IP address, and click 'Next'. If you

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choose 'From a List', the following screen appears. Select the host to which you would like to add a shortcut, and click 'Next'.

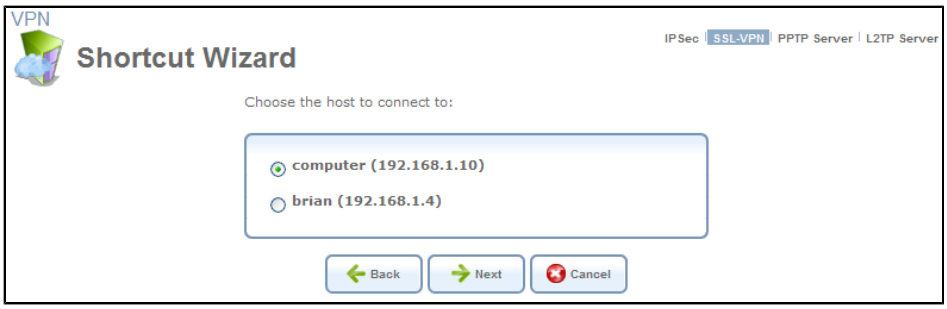

Figure 4.344 Choose Host from List

The next wizard screen appears, either with the IP address of a selected host, or without an IP address for manual selection.

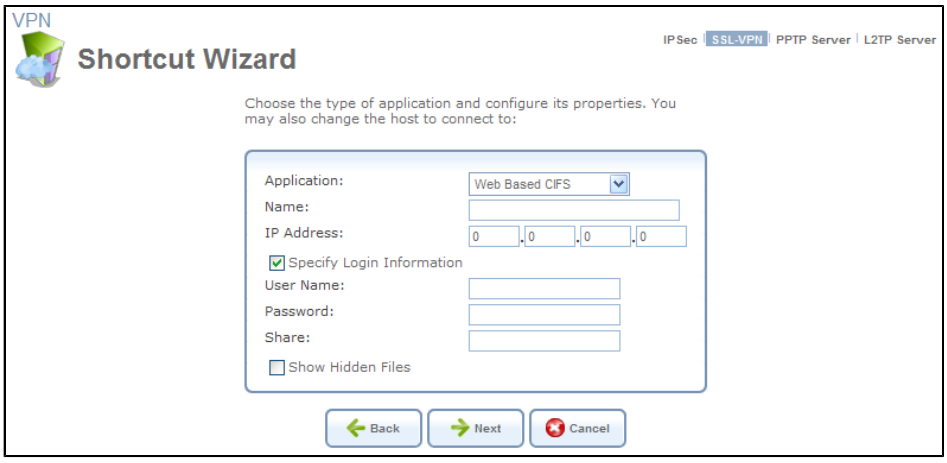

Figure 4.345 Select and Configure an Application

7. In the 'Application' drop-down menu, select 'Remote Desktop (RDP)'. The screen refreshes, displaying the RDP parameters.

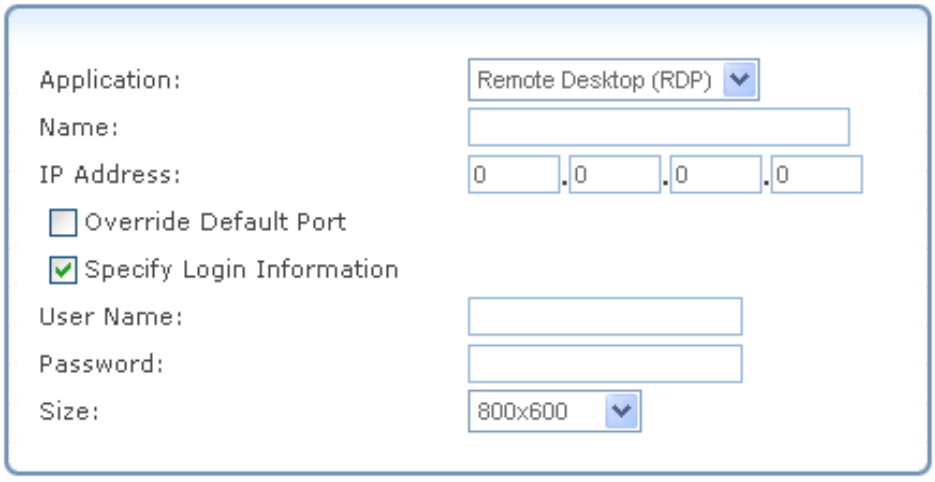

Figure 4.346 RDP Parameters

8. In this screen, perform the following:

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a. Enter a name for the shortcut.

b. Enter the IP address of the LAN computer on which the RDP will be performed.

c. Select the 'Override Default Port' option if the LAN computer uses a port other than the application's "well known" default port. An additional field appears, in which you must enter the alternative port.

d. If you choose the default setting of requiring the user to specify login information when connecting with RDP, provide the username and password that are used to login to the LAN computer.

e. Select the size of the screen in which the remote desktop application will be displayed.

Click 'Next'. The 'Shortcut Summary' screen appears.

VPN
Shortcut Summary
IPSec
SSL-VPN
PPTP Server
L2TP Server
You have successfully completed the steps needed to create the following shortcut:
Remote Desktop (RDP) application connection to '192.168.1.4'
The new shortcut will be saved as a global shortcut
Edit the Newly Created Shortcut
The new shortcut will be created without any SSL-VPN users and/or groups. In order for this shortcut to apply for SSL-VPN users and/or groups, you should check 'Edit the Newly Created Shortcut' checkbox and then add SSL-VPN users and/or groups as you wish.
Press Finish to create the shortcut.
Back
Finish
Cancel

Figure 4.347 Shortcut Summary

9. Select the 'Edit the Newly Created Shortcut' check box in order to associate a user or a group with this shortcut, and click 'Finish'. The 'Edit Shortcut' screen appears.

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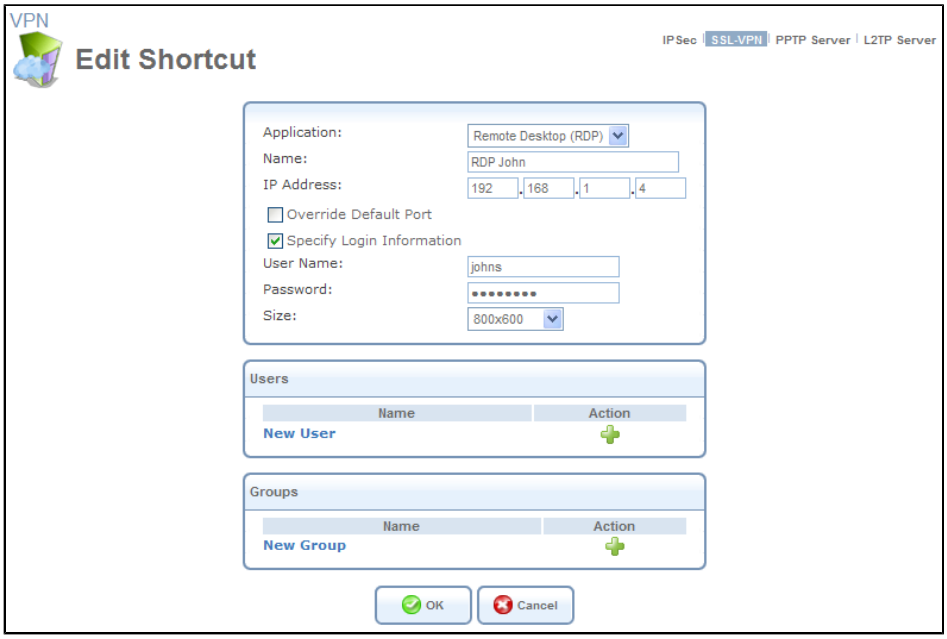

Figure 4.348 Edit Shortcut

10. Click the 'New User' link (or 'New Group' according to your preference), and select a user with remote SSL VPN access permission from the drop-down menu.

Figure 4.349 User

11. Click 'OK'. The new user is added to the 'Users' section in the 'Edit Shortcut' screen.

Figure 4.350 Associated User

12. Click 'OK' to save the settings. The new shortcut is added to the 'Shortcuts' screen, and will be available for this user when connecting to the SSL VPN portal.

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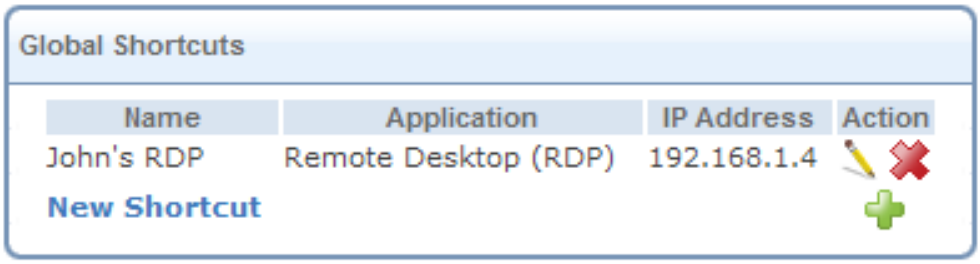

Figure 4.351 Global Shortcuts

4.11.2.1.2 Launching the Application

To launch the remote desktop application from a remote computer, perform the following:

1. Browse to OpenRG from a remote computer by typing **https://<OpenRG's Internet address>** (OpenRG's Internet address can be found under the 'Internet Connection' tab). For example, **https://10.71.86.21**.

2. Log in with the newly added user. The portal screen appears.

Figure 4.352 SSL VPN Portal

3. Click the 'Shortcuts' button. The 'Shortcuts' screen appears, displaying shortcuts to the available applications.

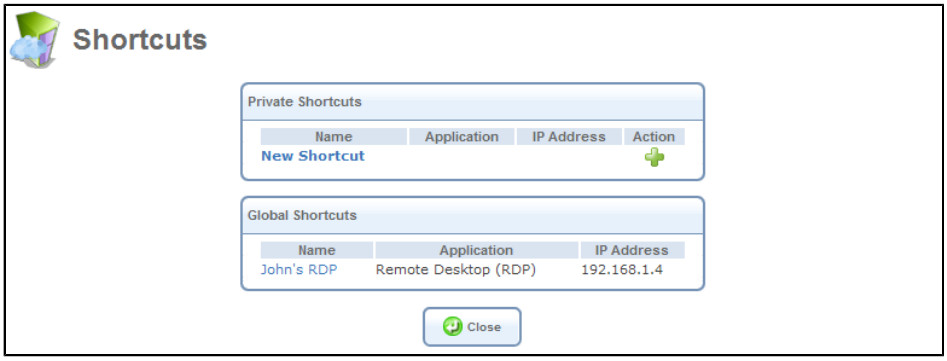

Figure 4.353 Shortcuts

4. Click the name of the RDP shortcut. A Remote Desktop session screen opens, prompting you for login details. Enter the computer's login username and password to gain RDP

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control. If an RDP screen fails to load, check that JRE is properly installed on the client computer.

4.11.2.2 Using Other Applications over SSL VPN

OpenRG provides the following popular applications that remote users can use to access the home network in order to perform various tasks. To set up an application, follow the remote desktop example described in the previous section. The only difference between the setups of the applications is in the parameters defined in the 'Shortcut Wizard' screen, as described in the following sections.

4.11.2.2.1 Web-based CIFS

This option enables the remote user to share files with a computer inside OpenRG's LAN using Jungo's Web-based Common Internet File System (Web-based CIFS). File sharing is performed from within the WBM, which displays the LAN computer's file system, and enables a vast set of actions described later in this section. In addition, this method does not require installing JRE, since no third-party software is used. In the 'Shortcut Wizard' screen, configure the following parameters.

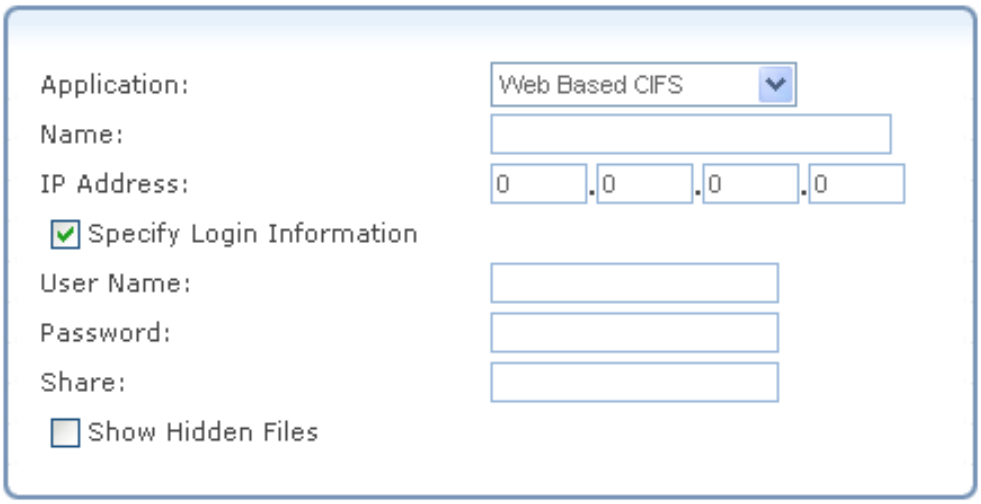

Figure 4.354 Web-based CIFS Parameters

Name Enter a name for this shortcut.

IP Address Enter the IP address of the LAN computer on which to perform the application.

Specify Login Information If the LAN computer requires a login, specify the following parameters to auto-login when launching the application:

User Name The user name with which to login.

Password The password with which to login.

Share Specify the name of the share directory on which to perform the application.

Show Hidden Files Select this check box to allow showing of hidden files.

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Once you configure a shortcut to Web-based CIFS and associate it with a user (or group), you can use the application when logged into the SSL VPN portal as that user, by clicking the shortcut link that appears in the 'Shortcuts' screen.

Figure 4.355 Shortcut to Web-based CIFS

If you had not specified a share directory name when configuring the shortcut, the link will lead you to the base directory of the host with the specified IP address.

Figure 4.356 Web-based CIFS Host

If you had specified a share directory name when configuring the shortcut (in this example —"home"), the link will lead you to the share directory on the specified host.

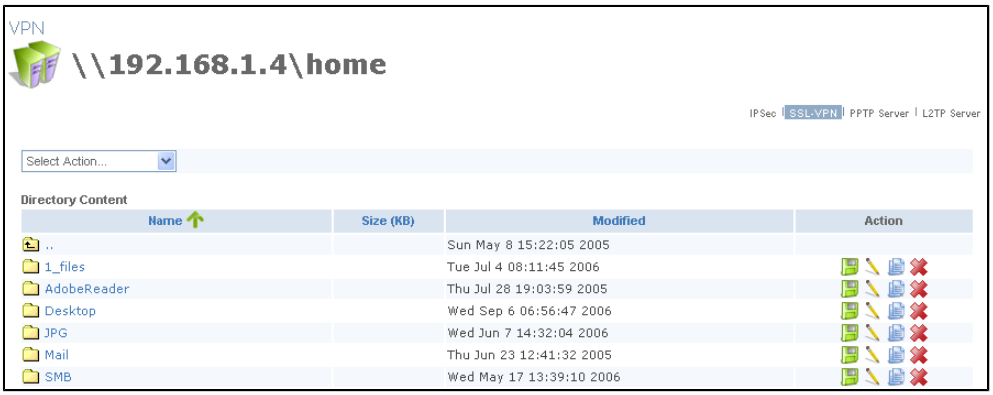

Figure 4.357 Web-based CIFS Share

The directory content is displayed, with the file name, size, last modification and actions you may perform on the file. You can browse the directory contents and sort the columns according to the file name, size or modification date. The action icons for each file and directory allow you to perform the following:

- Download

> Note: Directories are downloaded as tarball archives (in ***.tar** format).

- Rename

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- Copy to Clipboard
- Remove

You can perform additional actions using the drop-down menu.

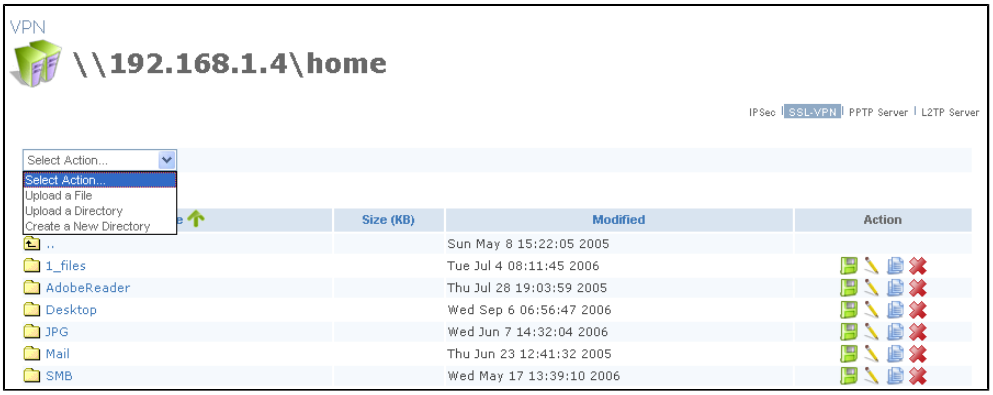

Figure 4.358 Web-based CIFS Actions

- **Upload a File** Select this option to upload a file to the share. The screen refreshes.

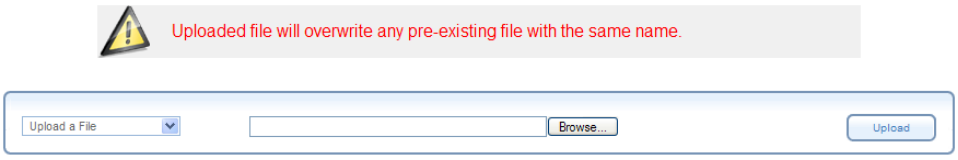

Figure 4.359 Upload a File

Enter the location of the file to upload, or click the 'Browse' button to browse for the file. Click the 'Upload' button to upload the file.

- **Upload a Directory** You can also upload an entire directory of files, by performing the following:

  1. Create a tarball archive out of the target directory.
  2. Enter the location of the archive, or click the 'Browse' button to browse to its location.
  3. Click the 'Upload' button to upload the archive.

- **Create a new Directory** You can create a new directory by simply typing its name and clicking the 'Go' button.
- **Paste from Clipboard** This option appears only after using the 'Copy to Clipboard' option (action icon) to copy a directory or file from one directory to another.

4.11.2.2.2 CIFS

This option enables the remote user to share files with a computer inside OpenRG's LAN using the Common Internet File System (CIFS). The protocol allows to manipulate files on a network

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computer just as if they were on the remote computer. Operations such as read, write, create, delete, and rename are all supported. In the 'Shortcut Wizard' screen, configure the following parameters.

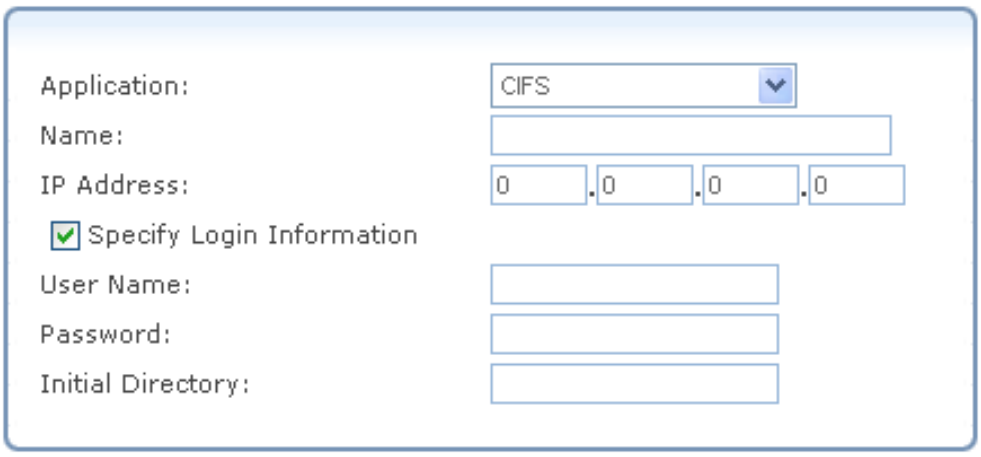

Figure 4.360 CIFS Parameters

Name Enter a name for this shortcut.

IP Address Enter the IP address of the LAN computer on which to perform the application.

Specify Login Information If the LAN computer requires a login, specify the following parameters to auto-login when launching the application:

User Name The user name with which to login.

Password The password with which to login.

Initial Directory Specify the root directory on which to perform the application. For example, **A/**, **C:\Program Files**, etc.

Once you configure a shortcut to CIFS and associate it with a user (or group), you can use the application when logged into the SSL VPN portal as that user, by clicking the shortcut link that appears in the 'Shortcuts' screen.

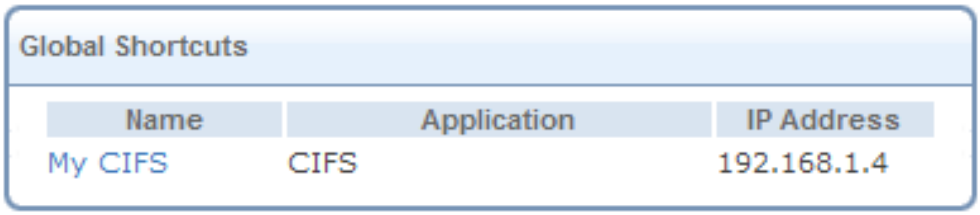

Figure 4.361 Shortcut to CIFS

4.11.2.2.3 VNC

This option enables the remote user to connect and control a computer inside OpenRG's LAN using the Virtual Network Connection (VNC) application (similar to RDP). In the 'Shortcut Wizard' screen, configure the following parameters.

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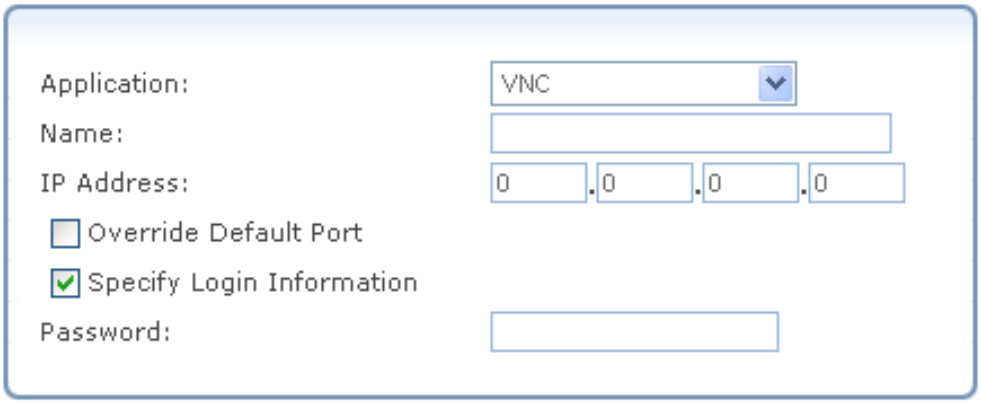

Figure 4.362 VNC Parameters

Name Enter a name for this shortcut.

IP Address Enter the IP address of the LAN computer on which to perform the application.

Override Default Port Select this option if the LAN computer uses a port other than the application's "well known" default port. An additional field appears, in which you must enter the alternative port.

Specify Login Information If the LAN computer requires a login, specify the following parameter to auto-login when launching the application:

Password The password with which to login.

Once you configure a shortcut to VNC and associate it with a user (or group), you can use the application when logged into the SSL VPN portal as that user, by clicking the shortcut link that appears in the 'Shortcuts' screen.

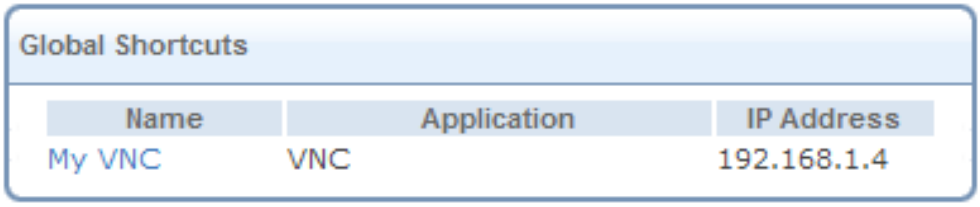

Figure 4.363 Shortcut to VNC

4.11.2.2.4 FTP

This option enables the remote user to transfer files between the remote computer and a computer inside OpenRG's LAN using the File Transfer Protocol (FTP) application. Note that an FTP server must be installed on the LAN computer. In the 'Shortcut Wizard' screen, configure the following parameters.

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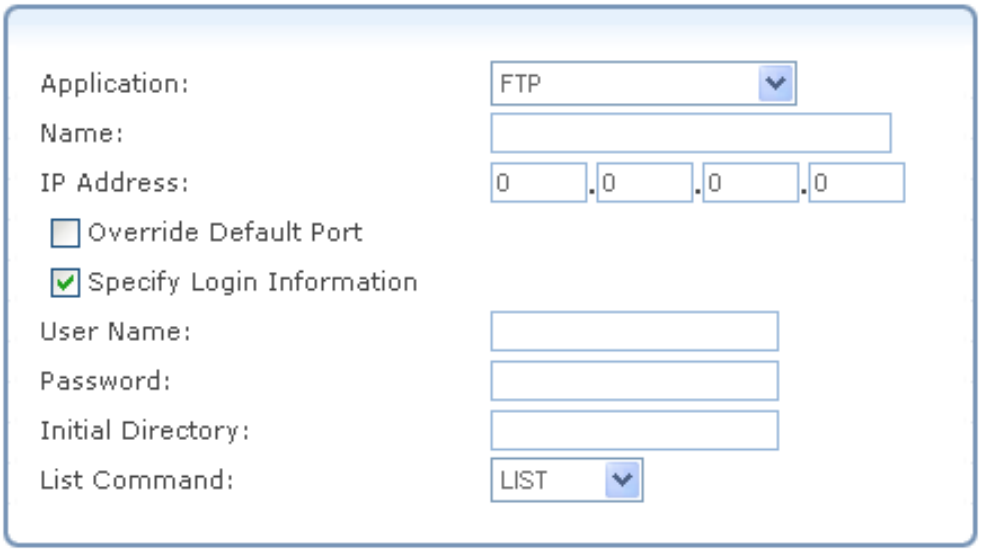

Figure 4.364 FTP Parameters

Name Enter a name for this shortcut.

IP Address Enter the IP address of the LAN computer on which to perform the application.

Override Default Port Select this option if the LAN computer uses a port other than the application's "well known" default port. An additional field appears, in which you must enter the alternative port.

Specify Login Information If the LAN computer requires a login, specify the following parameters to auto-login when launching the application:

User Name The user name with which to login.

Password The password with which to login.

Initial Directory Specify the root directory on which to perform the application. For example, **A/**, **C:\Program Files**, etc.

List Command Select the FTP command that determines the list of files and their properties available for FTP. You should only change this option if the LAN computer does not support the default "LIST" command.

Once you configure a shortcut to FTP and associate it with a user (or group), you can use the application when logged into the SSL VPN portal as that user, by clicking the shortcut link that appears in the 'Shortcuts' screen.

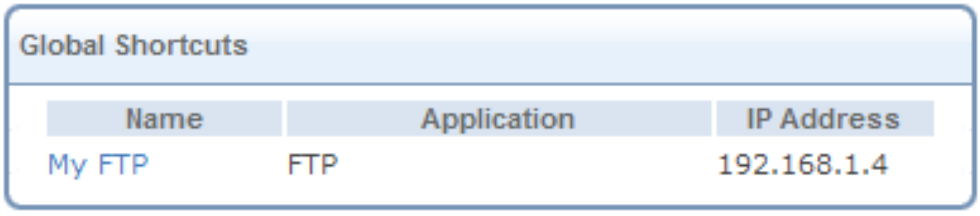

Figure 4.365 Shortcut to FTP

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4.11.2.2.5 Telnet

This option enables the user to connect and perform tasks on a computer inside OpenRG's LAN with the Telnet application. In the 'Shortcut Wizard' screen, configure the following parameters.

Figure 4.366 Telnet Parameters

Name Enter a name for this shortcut.

IP Address Enter the IP address of the LAN computer on which to perform the application.

Once you configure a shortcut to Telnet and associate it with a user (or group), you can use the application when logged into the SSL VPN portal as that user, by clicking the shortcut link that appears in the 'Shortcuts' screen.

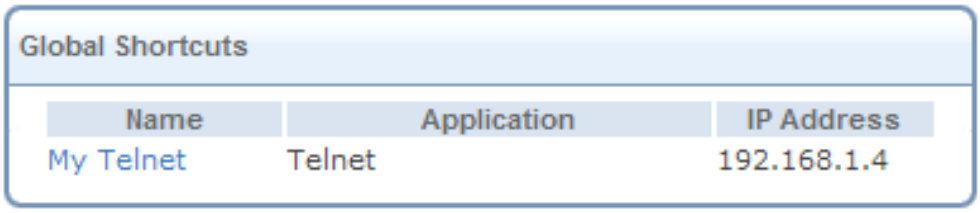

Figure 4.367 Shortcut to Telnet

4.11.2.3 Accessing and Using the SSL VPN Portal

The SSL VPN portal is accessible from within OpenRG for administration purposes, by clicking the 'SSL-VPN Portal' link in the 'SSL-VPN' screen (see Figure 4.339).

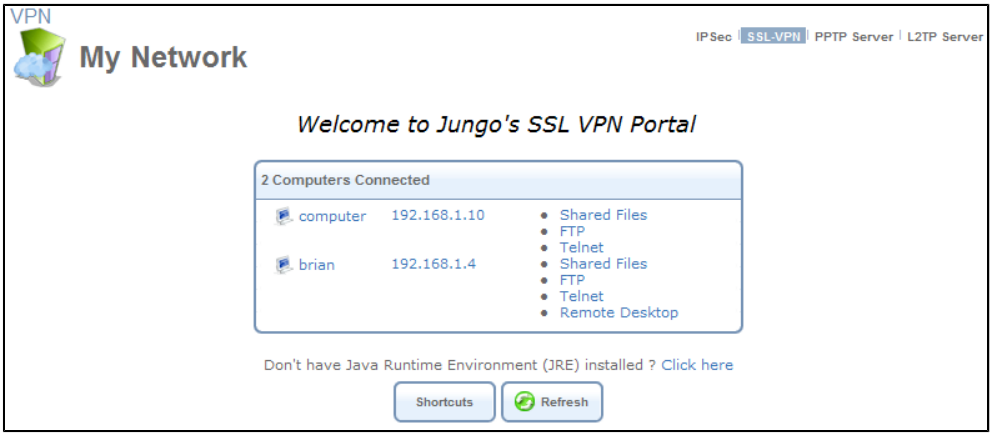

Figure 4.368 SSL VPN Portal Viewed from OpenRG

However, its purpose is to serve as an administrative portal for remote users who log into OpenRG from the Internet via HTTPS. To log in as a remote user, browse to OpenRG from a remote computer by typing **https://<OpenRG's Internet address>** (OpenRG's Internet address can be found under the 'Internet Connection' tab). For example, **https://10.71.86.21**. You will be required to provide the login details of the remote user with which you would like to connect.

The initial SSL VPN screen refreshes as OpenRG detects the open ports of each host, displaying links to applications (services) associated with these ports. This auto-detection utility is available in addition to the global shortcuts mechanism.

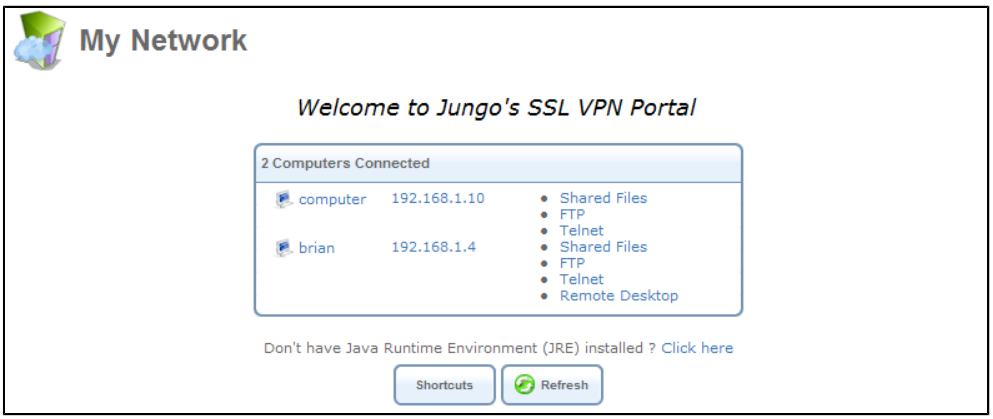

Figure 4.369 SSL VPN Portal Viewed from the Internet

Click a host name or IP address to view its information.

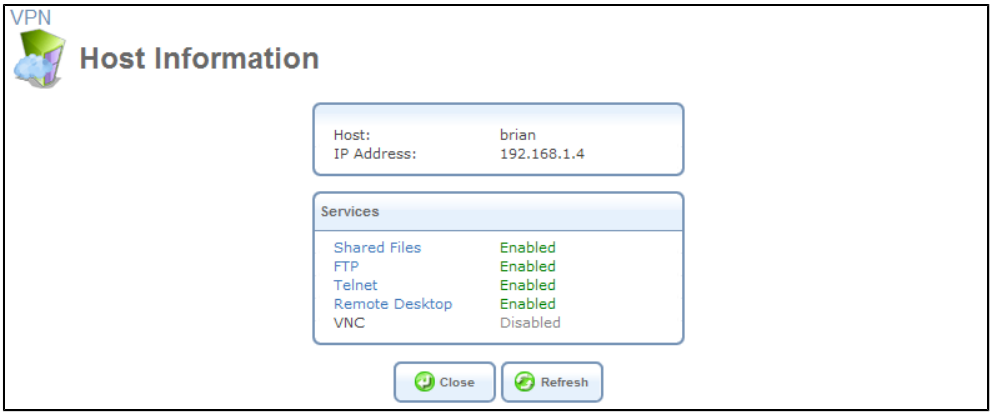

Figure 4.370 Host Information

When clicking an application link in the 'Services' section, OpenRG will attempt to use the login details of the logged-in user (in case the application requires a username and password).

Note: All available applications require the Java Runtime Environment (JRE) to be available on the remote computer. Use the "Click here" link at the bottom of the SSL VPN portal screen to install this environment.

Click 'Close' to return to the SSL VPN portal.

Global shortcuts are predefined with all the necessary parameters (including login details where required) to ensure a reliable application launch. Click the 'Shortcuts' button to view the available global shortcuts.

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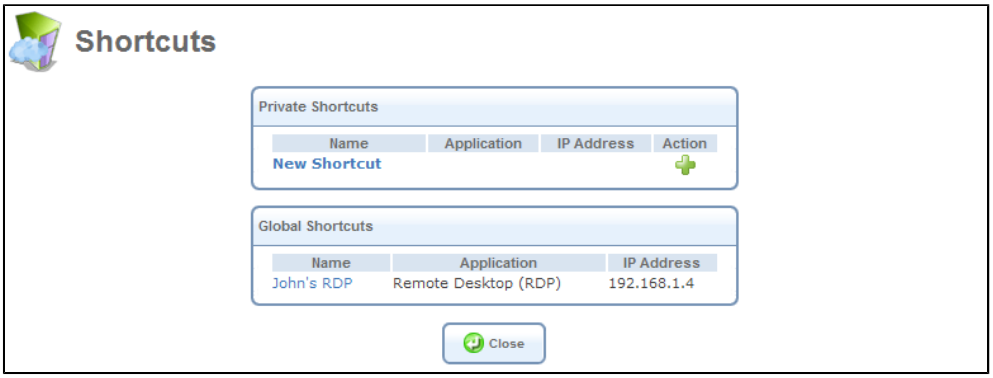

Figure 4.371 Shortcuts

4.11.2.3.1 Creating a Private Shortcut

In addition to the global shortcuts, each user can use the SSL-VPN portal to configure private shortcuts, displayed only for him when logged in. To add a new private shortcut, perform the following:

1. In the 'Private Shortcuts' section of the 'Shortcuts' screen, click the 'New Shortcut' link. The 'Shortcut Wizard' screen appears. This process is identical to the addition of a global shortcut.

2. After configuring the application parameters, click 'Next'. The following wizard screen appears.

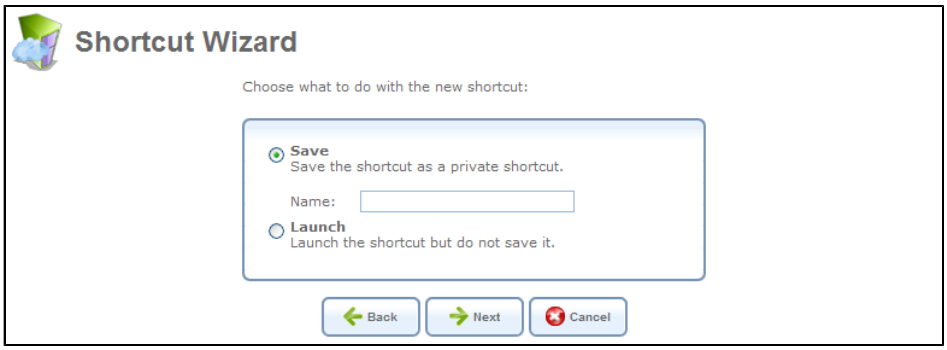

Figure 4.372 Save or Launch

3. You can either save the private shortcut or launch it without saving. Select a radio button and click 'Next'. The 'Shortcut Summary' screen appears.

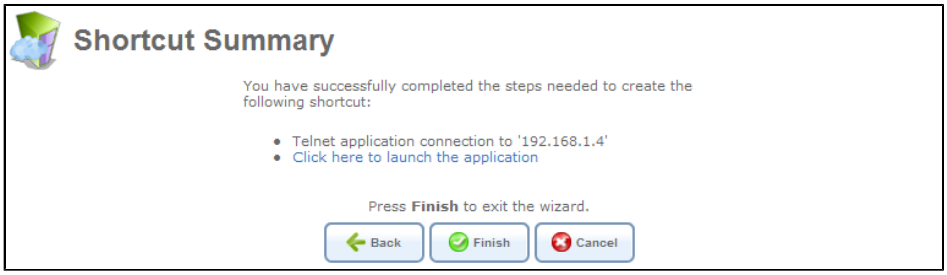
Shortcut Summary
You have successfully completed the steps needed to create the following shortcut:
Telnet application connection to '192.168.1.4'
Click here to launch the application
Press Finish to exit the wizard.
Back
Finish
Cancel

Figure 4.373 Launch

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4. If you chose "Launch", click the provided link. Otherwise, click 'Finish'. The new shortcut is added to the 'Private Shortcuts' section of the 'Shortcuts' screen, and will be available exclusively for this user when connecting to the SSL VPN portal.

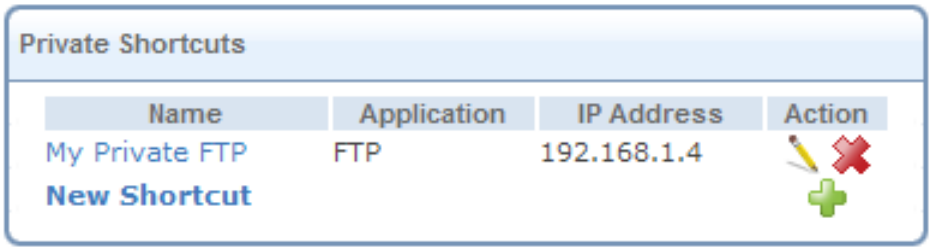

Figure 4.374 Private Shortcuts

4.11.2.3.2 Customizing the SSL VPN Portal

You can customize the look and the behavior of the SSL VPN portal from the 'SSL VPN' screen.

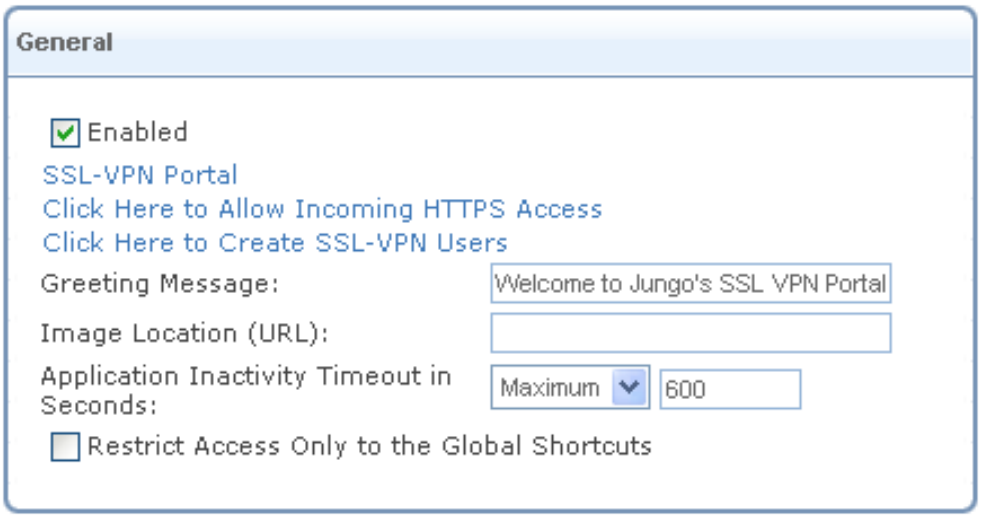

Figure 4.375 SSL VPN

Greeting Message Enter the greeting message that will appear at the top of the SSL VPN portal screen.

Image Location (URL) Enter the URL of an image you would like to display at the top-left of the portal screen (instead of the default image).

Application Inactivity Timeout in Seconds The timeframe of application idleness in seconds, after which the application disconnects. The user will have to use the shortcut to reactivate the application. Enter zero if you would like to un-limit this timeframe.

Restrict Access Only to the Global Shortcuts When checked, only the global shortcuts will appear and be accessible.

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4.11.3 Point-to-Point Tunneling Protocol Server

OpenRG can act as a Point-to-Point Tunneling Protocol Server (PPTP Server), accepting PPTP client connection requests.

4.11.3.1 Configuring the PPTP Server

Access this feature either from its link in the 'VPN' tab under the 'Services' screen, or by clicking the 'PPTP Server' icon in the 'Advanced' screen. The 'Point-to-Point Tunneling Protocol Server (PPTP Server)' screen appears:

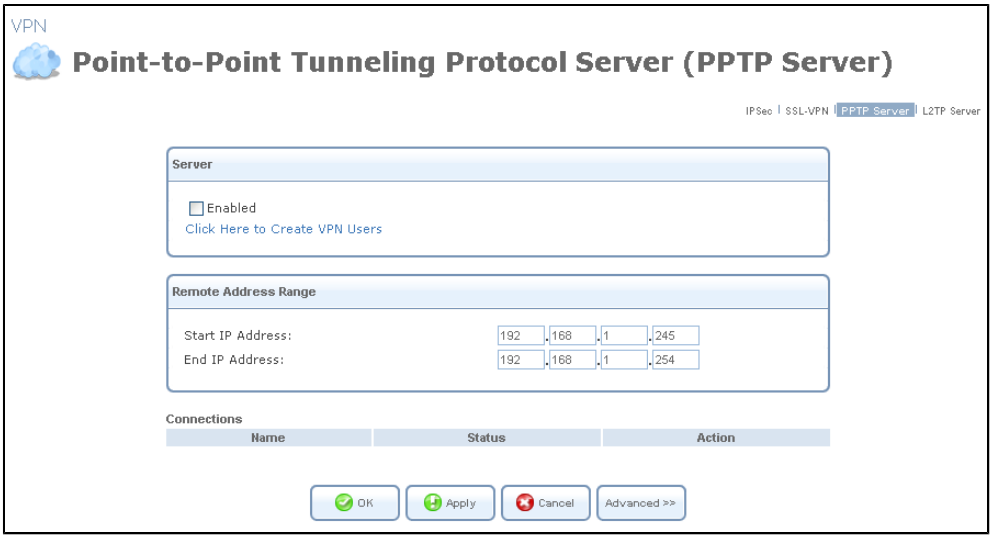

Figure 4.376 Point-to-Point Tunneling Protocol Server (PPTP Server)

This screen enables you to configure:

Enabled Select or deselect this check box to enable or disable this feature.
Note that checking this box creates a PPTP server (if not yet created with the wizard), but does not define remote users.

Click Here to Create VPN Users Click this link to define remote users that will be granted access to your home network. Refer to Section 5.3 to learn how to define and configure users.

Remote Address Range Use the 'Start IP Address' and 'End IP Address' fields to specify the range of IP addresses that will be granted by the PPTP server to the PPTP client.

4.11.3.2 Advanced PPTP Server Settings

To configure advanced PPTP server settings press the 'Advanced' button on the PPTP screen (see Figure 4.376). The screen expands, offering additional settings:

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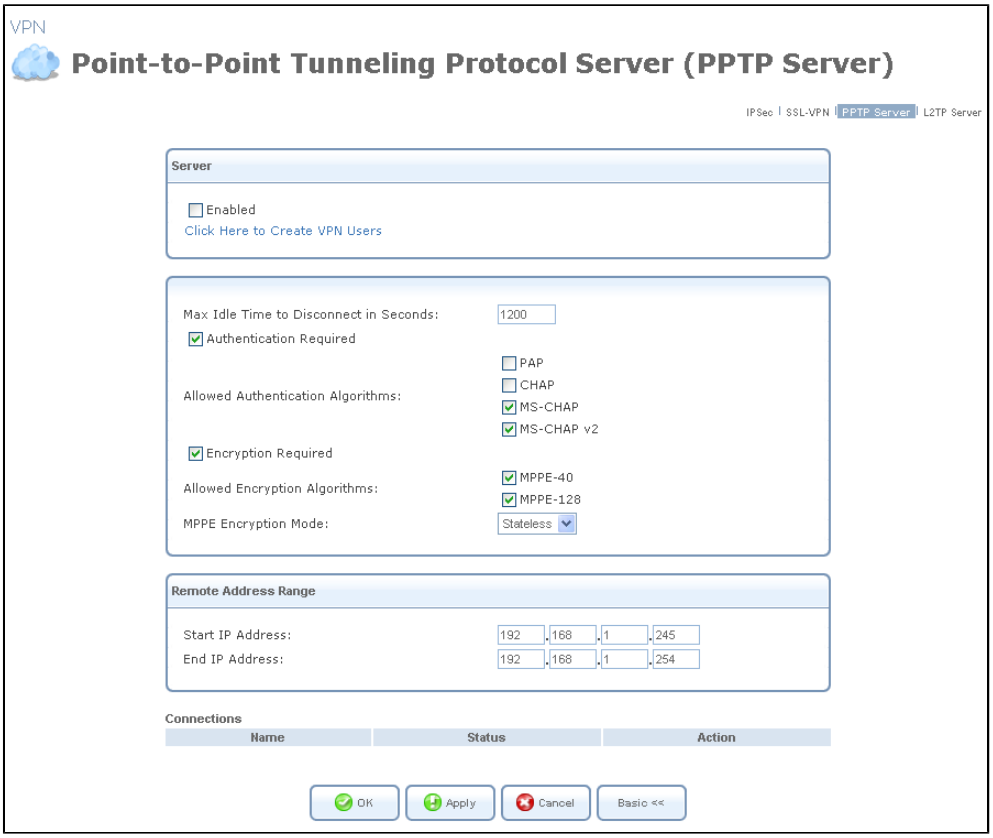

Figure 4.377 Advanced PPTP Server Parameters

Maximum Idle Time to Disconnect in Seconds Specify the amount of idle time (during which no data is sent or received) that should elapse before the gateway disconnects a PPTP connection.

Authentication Required Select whether PPTP will use authentication.

Allowed Authentication Algorithms Select the algorithms the server may use when authenticating its clients.

Encryption Required Select whether PPTP will use encryption.

Allowed Encryption Algorithms Select the algorithms the server may use when encrypting data.

MPPE Encryption Mode Select the Microsoft Point-to-Point Encryption mode: stateless or stateful.

Note that the server settings must be in tune with the client settings, described in the 'Setting Up a PPTP Connection' section of the OpenRG Administrator Manual.

4.11.4 Layer 2 Tunneling Protocol Server

OpenRG can act as a Layer 2 Tunneling Protocol Server (L2TP Server), accepting L2TP client connection requests.

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4.11.4.1 Configuring the L2TP Server

Access this feature either from the 'VPN' menu item under the 'Services' tab, or by clicking the 'L2TP Server' icon in the 'Advanced' screen. The 'Layer 2 Tunneling Protocol Server (L2TP Server)' screen appears.

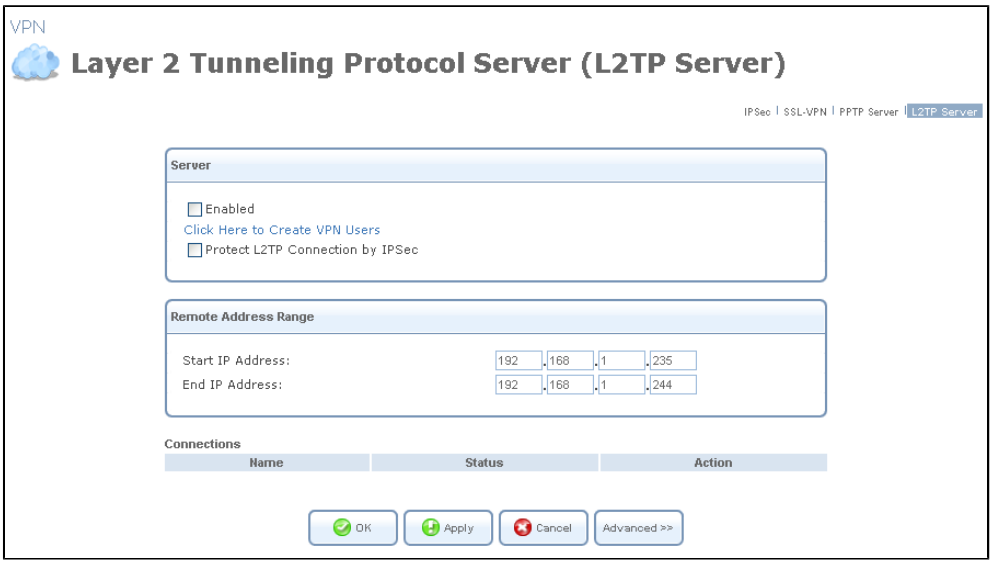

Figure 4.378 Layer 2 Tunneling Protocol Server (L2TP Server)

This screen enables you to configure the following connection settings:

Enabled Select or deselect this check box to enable or disable this feature.
Note that selecting this box creates an L2TP server (if not yet created with the wizard), but does not define remote users.

Click Here to Create VPN Users Click this link to define remote users that will be granted access to your home network. Refer to Section 5.3 to learn how to define and configure users.

Protect L2TP Connection by IPSec By default, the L2TP connection is not protected by the IP Security (IPSec) protocol. Select this option to enable this feature. When enabled, the following entry appears.

Create Default IPSec Connection When creating an L2TP Server with the connection wizard, a default IPSec connection is created to protect it. If you wish to disable this feature, uncheck this option. However, note that if L2TP protection is enabled by IPSec (see previous entry), you must provide an alternative, active IPSec connection in order for users to be able to connect. When this feature is enabled, the following entry appears.

L2TP Server IPSec Shared Secret You may change the IPSec shared secret, provided when the connection was created, in this field.

Remote Address Range Use the 'Start IP Address' and 'End IP Address' fields to specify the range of IP addresses that will be granted by the L2TP server to the L2TP client.

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4.11.4.2 Advanced L2TP Server Settings

To configure advanced L2TP server settings, click the 'Advanced' button in the L2TP Server screen (see Figure 4.378). The screen expands, offering additional settings.

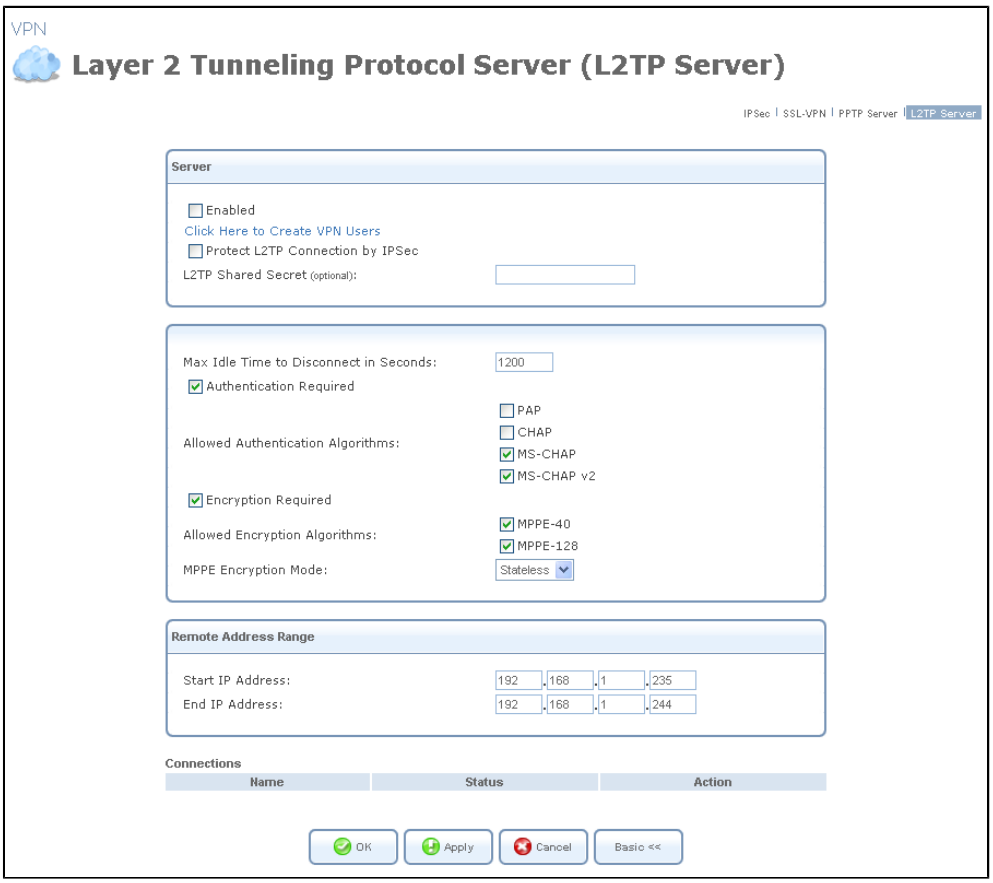

Figure 4.379 Advanced L2TP Server Parameters

L2TP Shared Secret (optional) Use this optional field to define a shared secret for the L2TP connection, for added security.

Maximum Idle Time to Disconnect in Seconds Specify the amount of idle time (during which no data is sent or received) that should elapse before the gateway disconnects the L2TP connection.

Authentication Required Select whether L2TP will use authentication.

Allowed Authentication Algorithms Select the algorithms the server may use when authenticating its clients.

Encryption Required Select whether L2TP will use encryption.

Allowed Encryption Algorithms Select the algorithms the server may use when encrypting data.

MPPE Encryption Mode Select the Microsoft Point-to-Point Encryption mode: stateless or stateful.

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4.11.4.3 Configuring an L2TP over IPSec VPN Client

If you wish to connect to OpenRG's L2TP server (with the default IPSec configuration) using the Windows IPSec client, configure your host's L2TP connection with the following:

- Your login credentials (for more information, refer to Section 5.3)
- The L2TP server's IPSec shared secret (for more information, refer to Section 4.11.4.1).
- The L2TP server's IP address (OpenRG's WAN address)

In case you wish to use a third-party IPSec client (for example, Netscreen) with your L2TP connection, configure the client with the following parameters. Note that these parameters match the gateway's default IPSec VPN connection parameters.

Remote Party's Identity

- **ID Type** Select 'IP Address', and specify OpenRG's WAN IP address.
- **Protocol** Select UDP.
- **Port** Select L2TP 1701.

My Identity

- **ID Type** Select 'IP Address'.
- **Port** Select L2TP 1701.

Security Policy Select the 'Main' mode.

Phrase 1 Negotiation Mode

- Select 'IPSec Shared Secret' as the peer authentication method, and enter the shared secret defined in the L2TP server's IPSec VPN settings.
- Define the encryption algorithm—by default, OpenRG supports the 3DES-CBC algorithm.
- Define the hash algorithm—OpenRG supports both the MD5 and SHA1 algorithms.
- Define the Key group—by default, OpenRG supports Diffie-Hellman (DH) Group 2 and Group 5.

Phrase 2 Negotiation Mode

- Enable the 'Encapsulation Protocol' option.
- Define the encryption and hash algorithms exactly as in Phase 1.
- Set the encapsulation method to 'Transport'.

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4.12 Bluetooth Settings

Yet another method to connect to OpenRG's LAN is by Bluetooth, an open specification for wireless, short-range transmission between PCs, mobile phones and other portable devices. When connected to OpenRG via Bluetooth, users can benefit from standard network connectivity, limited only by the capabilities of their connected devices. OpenRG utilizes the Bluetooth Network Encapsulation Protocol (BNEP), used by the Bluetooth Personal Area Network (PAN) profile. This layer encapsulates packets from various networking protocols, which are transported directly over the Logical Link Control and Adaptation Protocol (L2CAP) layer.

Hardware Note: Platforms that do not feature an integrated Bluetooth chip, require a Linux-supported Bluetooth dongle, which can be connected to the gateway either by USB or PCI.

As soon as a Bluetooth dongle is connected, OpenRG can be found and connected to by Bluetooth devices. To configure OpenRG's Bluetooth settings, perform the following steps:

1. Access the Bluetooth settings either from its link in the 'Advanced' tab under the 'Services' screen, or by clicking the 'Bluetooth Settings' icon in the 'Advanced' screen. The 'Bluetooth Settings' screen appears. Select the 'Enabled' check box to enable this feature.

Figure 4.380 Bluetooth Settings

Enabled Select this check-box to enable Bluetooth connections to OpenRG.

Host Name OpenRG's identification name in the PAN. You can change the default to any string.

Authentication Level Select the level of authentication to be performed upon a connection request:

None Connect without authentication.

Enabled Enable authentication using a pin number, which will have to be provided by the device wishing to connect.

Encrypt Enable and encrypt the authentication method.

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PIN Enter a value for the authentication/encryption key if you selected the 'Enabled' or 'Encrypted' options above.

2. Click 'OK' to save the settings.

The new Bluetooth connection will be added to the network connections list under the LAN bridge, and will be configurable like any other connection.

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5

System

5.1 Viewing the System Information

The 'Overview' screen (see Figure 5.1) displays the gateway's software and hardware characteristics, as well as its uptime.

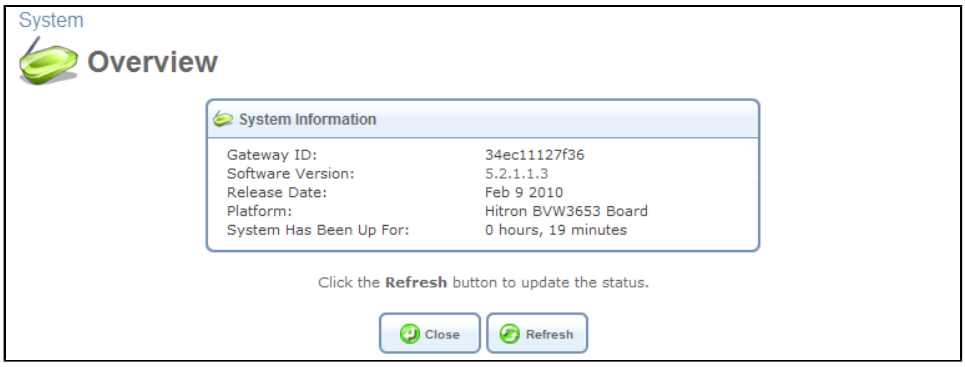

Figure 5.1 System Overview

5.2 Setting the Date and Time

The 'Date and Time' menu item enables you to configure your gateway's time zone and daylight saving (summer time) settings.

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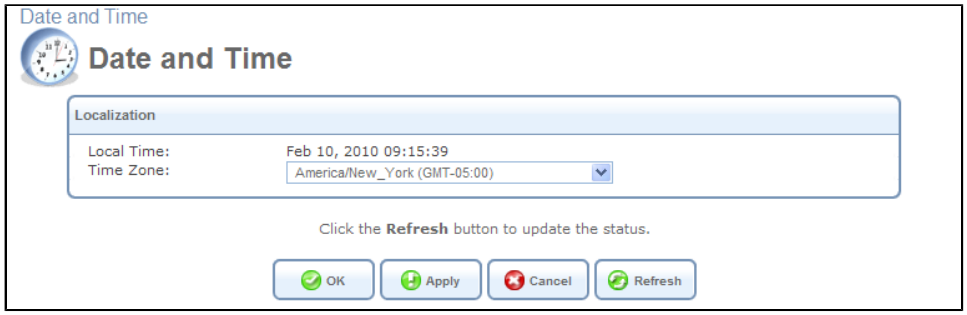

Figure 5.2 Date and Time Settings

- **Setting Your Local Time Zone**
  From the 'Time Zone' drop-down menu, select a time zone that corresponds to your current location. If you wish to manually define your time zone settings, select the 'Other' option. The screen refreshes, displaying the 'GMT Offset' field.

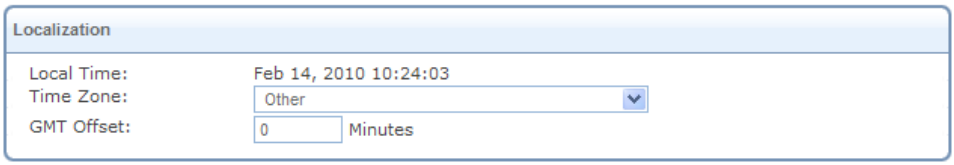

Figure 5.3 Local Time Zone – GMT Offset

This field enables you to manually adjust your local time's offset from the Greenwich Mean Time (GMT).

- **Configuring the Daylight Saving Settings**
  OpenRG automatically detects the daylight saving settings of a large number of time zones, by using its internal time zone database. There are several time zones, however, for which the daylight saving settings have not been preset on OpenRG, as they may vary occasionally. In case the daylight saving settings of your selected time zone may periodically vary, the following fields appear, enabling you to manually configure your local daylight saving time.

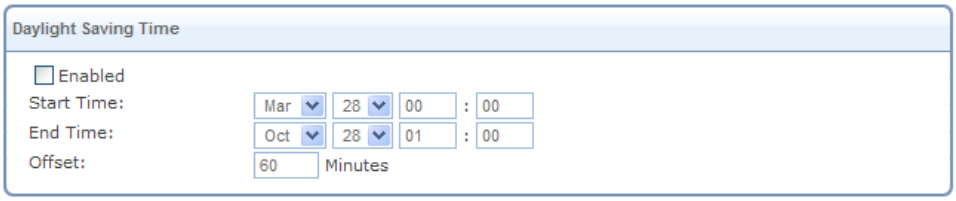

Figure 5.4 Daylight Saving Settings

Enabled Select this check box to automatically enable the daylight saving mode during the period specified below.

Start A date and time when your time zone's daylight saving period starts.

End A date and time when your time zone's daylight saving period ends.

Offset A daylight saving time offset from the standard (winter) time.

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- If you want the gateway to periodically perform an automatic time update, proceed as follows:

  1. Select the 'Enabled' check box under the 'Automatic Time Update' section.

  2. Select the protocol to be used to perform the time update by selecting either the 'Time of Day' or 'Network Time Protocol' radio button.

  3. In the 'Update Every' field, specify the frequency of performing the update.

  4. By default, OpenRG is configured with Jungo's NTP server for testing purposes only. You can define another time server address by clicking the 'New Entry' link at the bottom of the 'Automatic Time Update' section. You can find a list of time server addresses sorted by region at http://www.pool.ntp.org.

In addition, OpenRG can function as a Simple Network Time Protocol (SNTP) server, enabling you to automatically update the time settings of your computers from a single but reliable source. By default, OpenRG's SNTP server is enabled. To synchronize time between the SNTP server and a PC connected to the gateway, perform the following:

1. In the 'Automatic Time Update' section of the 'Date and Time' screen (see Figure 5.2), click the 'Network Time Protocol (NTP)' radio button.

2. Click 'OK' to save the settings.

3. On a PC connected to the gateway, perform the following:

   Note: The following explanations are based on the Windows XP user interface.

   1. In Control Panel, double-click the 'Date and Time' icon. The 'Date and Time Properties' window appears.

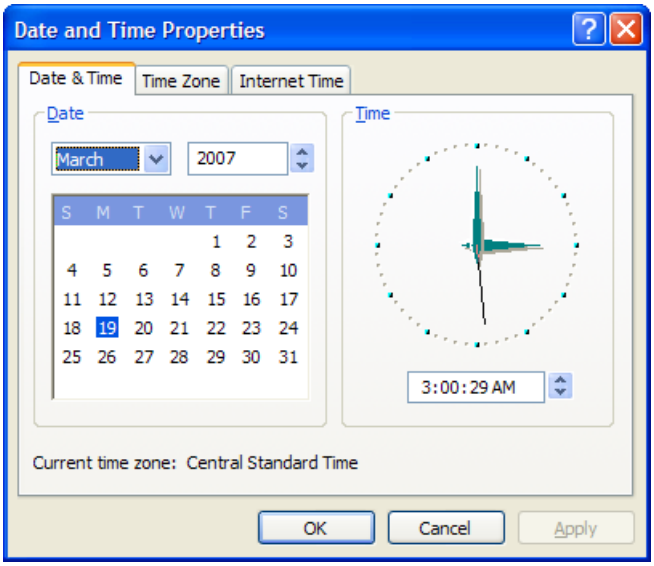

Figure 5.5 Windows – Date and Time Properties

2. Click the 'Internet Time' tab. The window changes to the following.

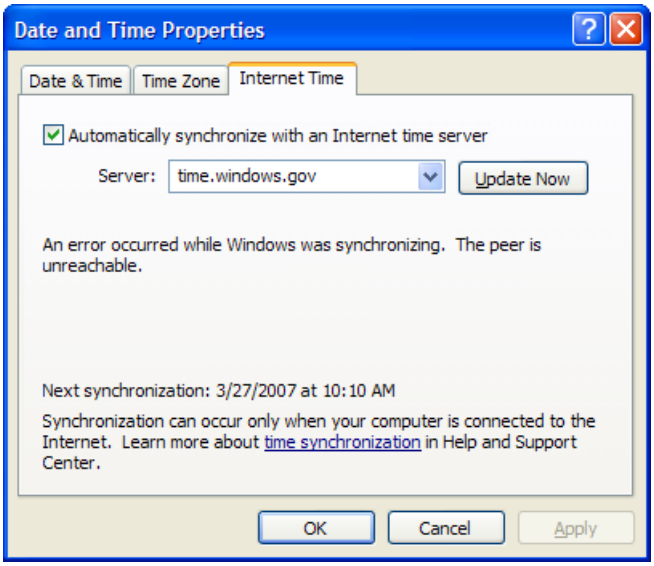
Date and Time Properties
Date & Time
Time Zone
Internet Time
Automatically synchronize with an Internet time server
Server:
time.windows.gov
Update Now
An error occurred while Windows was synchronizing. The peer is unreachable.
Next synchronization: 3/27/2007 at 10:10 AM
Synchronization can occur only when your computer is connected to the Internet. Learn more about time synchronization in Help and Support Center.
OK
Cancel
Apply

Figure 5.6 Windows – Internet Time Screen

3. In the 'Server' field, enter OpenRG's LAN IP address (The default one is 192.168.1.1).
4. Click 'Update Now'. Windows will synchronize with OpenRG's SNTP server. In addition, Windows will perform a periodical synchronization with the SNTP server.
5. Click 'OK' to save the settings.

5.3 Managing Users

The 'Users' menu item enables you to view and edit the defined user accounts, as well as create new ones.

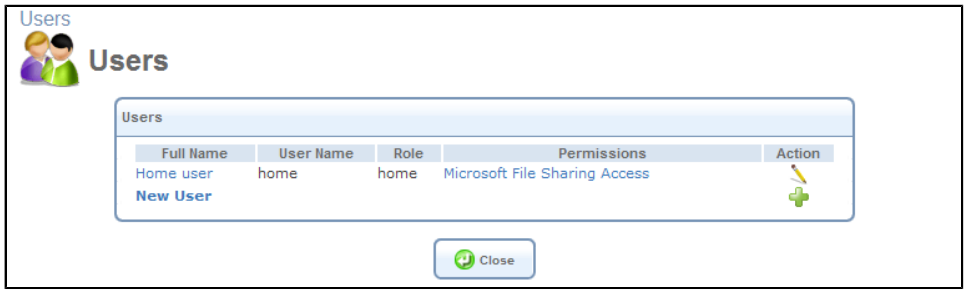

Figure 5.7 Users

By default, only one user account (*Home*) is available. You can create additional users as described in the following section.

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5.3.1 Adding a User

To add a new user, click the 'New User' link. The 'User Settings' screen appears.

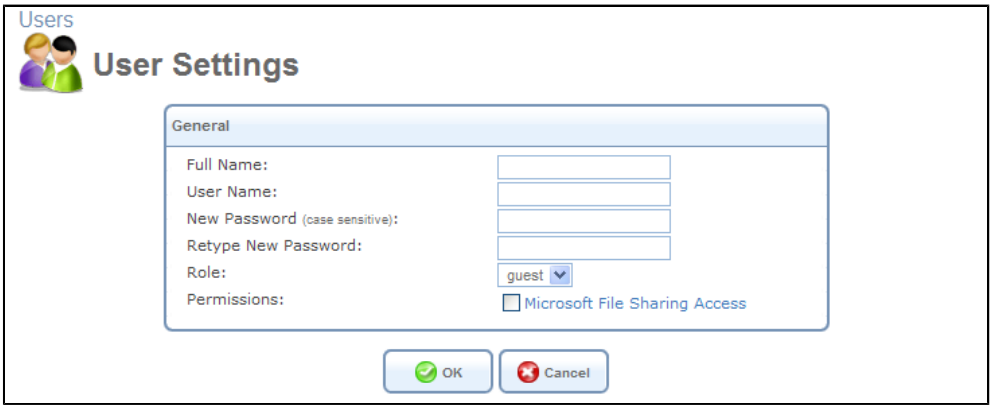

Figure 5.8 User Settings

Enter the following information:

- **Full Name** The user's full name.
- **User Name** An authentication name that the user will have to enter in order to access your network.
- **New Password** The user's password.
- **Retype New Password** Type the password again to verify its correctness.
- **Primary Group** This check box will only appear after a user is defined, enabling you to select the primary group to which this user will belong.
- **Role** This drop-down menu enables you to define the user's role, which represents a specific set of permissions available in OpenRG. This set of permissions defines which features the user will be allowed to use by default, and to what extent. For example, the default home and administrator users are assigned the 'home and 'admin' roles respectively. The 'home' role is a set of permissions that is intended for OpenRG's end user(s), and the 'admin' role —for a network administrator or technician.

  As a home user, you can either assign the 'guest' or the 'home' role to the new user account. The 'guest' role does not grant the user access to the WBM. On the other hand, you can allow a guest user to access to specific OpenRG services that appear in the 'Permissions' field.Note that as a home user, you can neither assign the 'admin' role to the new user, nor edit settings of the existing administrator account.

- **Permissions** Select the user's privileges on your home network.
  - **Telnet** Grants the permission to remotely access OpenRG's CLI via Telnet (**Available to administrators only**).

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- **Serial Console** Grants the permission to log in to OpenRG's command prompt using a serial console, such as Minicom (**Available to administrators only**).

- **Wireless Permissions** Grants the permission to connect to the Internet via OpenRG's wireless access point. This permission level does not provide you with access to OpenRG's WBM, unless you have administrative rights.

Note: This permission is applicable only if the OpenRG wireless access point is configured with the 'Web Authentication' security level.

- **Remote Access by SSL-VPN** Grants remote access to OpenRG using the SSL-VPN protocol.

- **Microsoft File Sharing Access** Grants the permission to access shared directories of OpenRG's file server from a LAN computer. For more information on using OpenRG's file server and managing access to it, refer to Section 4.7.1.

- **Remote Access by VPN** Grants remote access to OpenRG using the VPN protocol.

5.3.2 Disk Management

Enable User Home Directory By default, this option is selected. When activated, it creates a directory for the user in the 'Home' directory of the system storage area. This directory is necessary when using various applications, such as the mail server. For more information, refer to Section 4.7.2.2.

5.3.3 E-Mail Notification

You can use email notification to receive indications of system events for a predefined severity classification. The available types of events are 'System' or 'Security' events. The available severity of events are 'Error', 'Warning' and 'Information'.

If the 'Information' level is selected, the user will receive notification of the 'Information', 'Warning' and 'Error' events. If the 'Warning' level is selected, the user will receive notification of the 'Warning' and 'Error' events etc.

To configure email notification for a specific user:

- Make sure you have configured an outgoing mail server in 'System Settings'. A click on the 'Configure Mail Server' link will display the 'System Settings' screen where you can configure the outgoing mail server.

- Enter the user's email address in the 'Address' field of the 'Email' section.

- Select the 'System' and 'Security' notification levels in the 'System Notify Level' and 'Security Notify Level' drop-down menu respectively.

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5.3.4 Group Settings

You may assemble your defined users into different groups, based on different criteria—for example, home users versus office users. By default, new users will be added to the default group "Users". To add a new group, click the 'New Group' link. The 'Group Settings' screen appears.

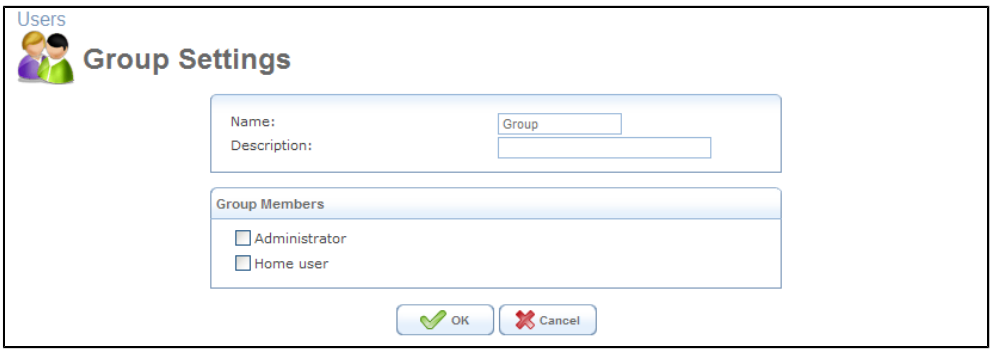

Figure 5.9 Group Settings

Name Enter a name for the group of users.

Description You may also enter a short description for the group.

Group Members Select the users that will belong to this group. All users defined are presented in this section. A user can belong to more than one group.

5.3.5 Editing a User's Profile

To edit a user's profile (for example, change the assigned permissions or password), click the user's link or the corresponding action icon (see Figure 5.7). The 'User Settings' screen appears.

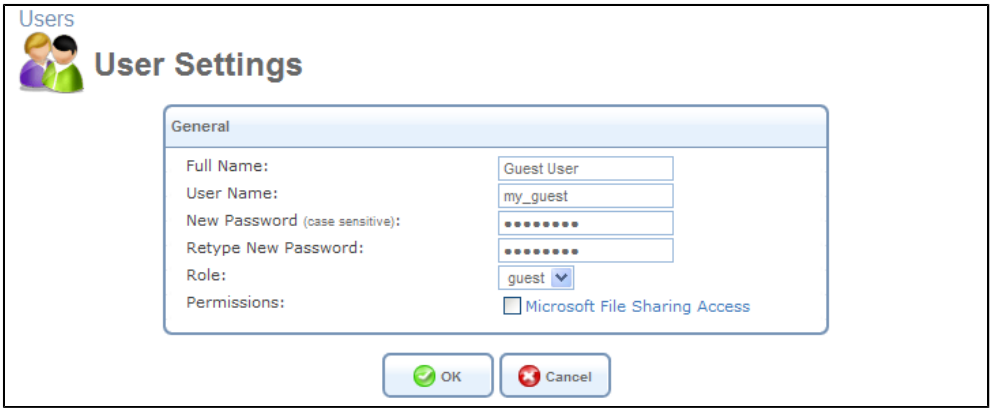

Figure 5.10 User Settings

After making the necessary changes, click 'OK' to save them.

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5.4 Performing Advanced Management Operations

5.4.1 Utilizing OpenRG's Universal Plug and Play Capabilities

Universal Plug-and-Play (UPnP) is a networking technology that provides compatibility among networking equipment, software, and peripherals.

Your gateway is at the forefront of this technology, offering a complete software platform for UPnP devices. This means that any UPnP-enabled LAN device can dynamically join your network, obtain an IP address, and exchange information about its capabilities and those of other devices on your home network. All this happens automatically, providing a truly zero-configuration network.

The most widespread and trivial example of utilizing OpenRG's UPnP feature is connecting a PC to OpenRG. If your PC is running an operating system that supports UPnP, such as Windows XP™, you will only need to connect it to one of the gateway's LAN sockets. The PC is automatically recognized and added to the local network.

Likewise, you can add any other UPnP-enabled device (for example, a media streamer, digital picture frame, etc.) to your home network.

5.4.1.1 Configuring OpenRG's UPnP Settings

OpenRG's UPnP feature is enabled by default. You can access the UPnP settings from the 'Management' menu item, by clicking the 'Universal Plug and Play' link, or by clicking the 'Universal Plug and Play' icon in the 'Advanced' screen. The 'Universal Plug and Play' settings screen appears.

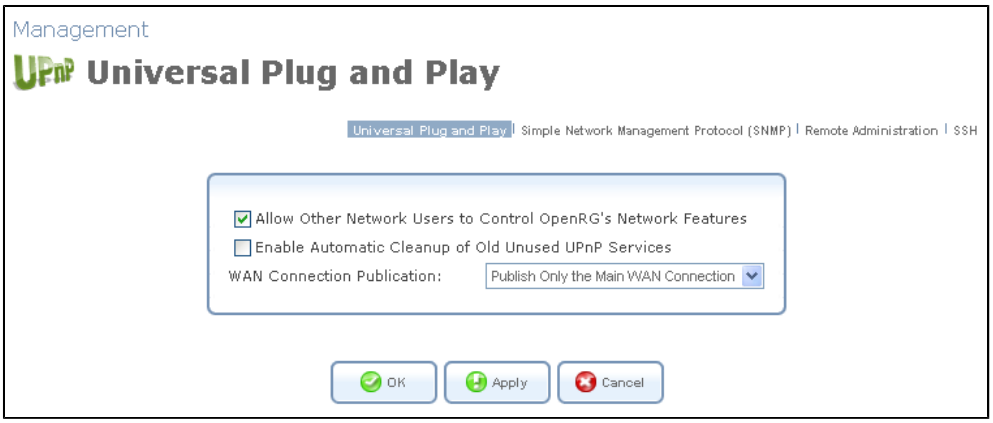

Figure 5.11 Universal Plug and Play

Allow Other Network Users to Control OpenRG's Network Features Selecting this check-box enables the UPnP feature. This will allow you to define local services on any of the

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LAN hosts, and to make the services available to computers on the Internet, as described in Section 5.4.1.2.

Enable Automatic Cleanup of Old Unused UPnP Services When this check box is selected, OpenRG periodically checks the availability of the LAN computers that have been configured to provide the local services. In case such a LAN computer is disconnected, OpenRG removes the port forwarding rule that enables access to the corresponding local service (for more information about port forwarding rules, refer to Section 4.2.3).

WAN Connection Publication By default, OpenRG will publish only its main WAN connection, which will be controllable by UPnP entities. However, you may select the 'Publish All WAN Connections' option if you wish to grant UPnP control over all of OpenRG's WAN connections.

5.4.1.2 Granting Remote Access to Your LAN Services Using UPnP

You may also make the services provided by your LAN computers available to computers on the Internet. For example, you may designate a UPnP-enabled Windows PC in your home network to act as a Web server, allowing computers on the Internet to request pages from it. Another example is a game that you may wish to play with other people over the Internet. Some online games require that specific ports be opened to allow communication between your PC and other online players.

- To make your local services available to computers on the Internet:

  1. On your PC (which provides the service), open the 'Network Connections' window.

  2. Right-click 'Internet Connection' and choose 'Properties'. The 'Internet Connection Properties' window appears.

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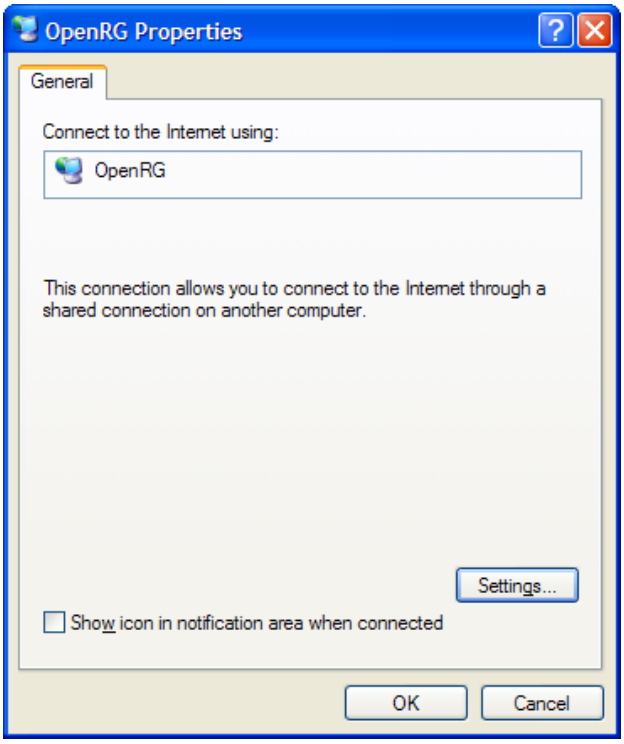

Figure 5.12 Internet Connection Properties

3. Click the 'Settings' button. The 'Advanced Settings' window appears.

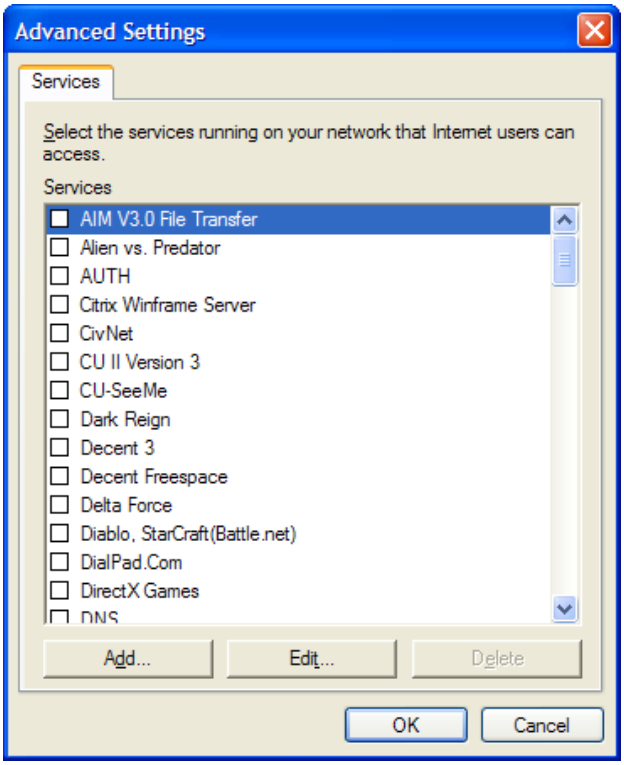

Figure 5.13 Advanced Settings

4. Select a local service that you would like to make available to computers on the Internet. The 'Service Settings' window will automatically appear.

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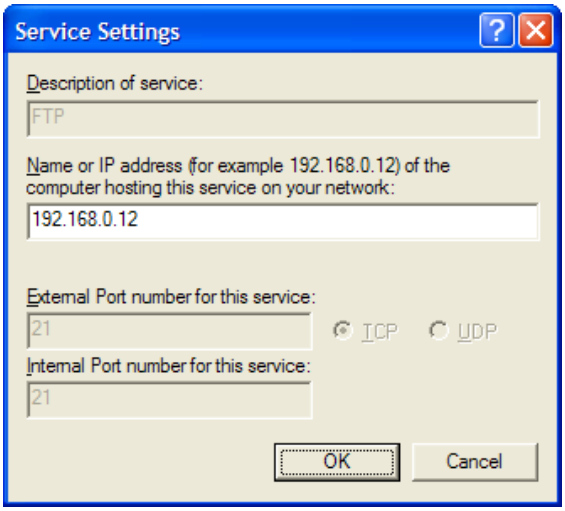

Figure 5.14 Service Settings: Edit Service

5. Enter the PC's local IP address and click 'OK'.
6. Select other services as desired, and repeat the previous step for each.
7. Click 'OK' to save the settings.

- To add a local service that is not listed in the 'Advanced Settings' window:

1. Follow steps 1-3 above.
2. Click the 'Add...' button. The 'Service Settings' window appears.

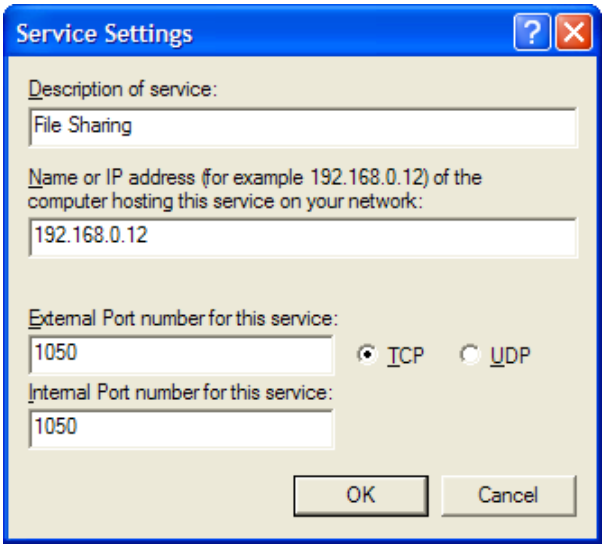

Figure 5.15 Service Settings: Add Service

3. Complete the fields as indicated in the window.
4. Click 'OK' to close the window and return to the 'Advanced Settings' window. The service will be selected.

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5. Click 'OK' to save the settings.

5.4.2 Simple Network Management Protocol

Simple Network Management Protocol (SNMP) enables network management systems to remotely configure and monitor OpenRG. Your Internet Service Provider (ISP) may use SNMP in order to identify and resolve technical problems. Technical information regarding the properties of OpenRG's SNMP agent should be provided by your ISP. To configure OpenRG's SNMP agent, perform the following:

1. Access this feature either from the 'Management' menu item under the 'System' tab, or by clicking its icon in the 'Advanced' screen. The 'SNMP' screen appears:

Figure 5.16 SNMP Management

2. Specify the SNMP parameters, as provided by your Internet service provider:

   Allow Incoming WAN Access to SNMP Select this check box to allow access to OpenRG's SNMP over the Internet.

   Read-only/Write Community Names SNMP community strings are passwords used in SNMP messages between the management system and OpenRG. A read-only community allows the manager to monitor OpenRG. A read-write community allows the manager to both monitor and configure OpenRG.

   Trusted Peer The IP address, or subnet of addresses, that identify which remote management stations are allowed to perform SNMP operations on OpenRG.

   SNMP Traps Messages sent by OpenRG to a remote management station, in order to notify the manager about the occurrence of important events or serious conditions. OpenRG supports both SNMP version 1 and SNMP version 2c traps. Check the Enabled check box to enable this feature. The screen refreshes, displaying the following fields.

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Figure 5.17 SNMP Traps

- **Version** Select between version SNMP v1 and SNMP v2c.
- **Destination** The remote management station's IP address.
- **Community** Enter the community name that will be associated with the trap messages.

5.4.2.1 Defining an SNMPv3 User Account

Simple Network Management Protocol version 3 (SNMPv3) enables you to perform certain management and monitoring operations on OpenRG outside its WBM. Information is exchanged between a management station and OpenRG's SNMP agent in the form of an SNMP message. The advantage of the third version of SNMP over the previous versions is that it provides user authentication, privacy, and access control.

SNMPv3 specifies a User Security Model (USM) that defines the need to create an SNMP user account, in order to secure the information exchange between the management station and the SNMP agent. The following example demonstrates how to define an SNMPv3 user account in OpenRG. Let's assume that you want to add a new SNMPv3 user called "admin". For this purpose, perform the following steps:

1. Add the SNMPv3 user account to the USM table.
2. Associate the user with a new or an existing group.
3. Associate the group with specific views.
4. Create the group views.

Step 1 is performed from OpenRG's CLI. Steps 2–4 are performed from a Linux shell, as in the following example.

1. Add the new user (admin) to the USM table, by running the following `conf set` commands from OpenRG's CLI:

```
OpenRG> conf set /snmp/mibs/usm_mib/usmuser_table/13.128.0.42.47.128.242.184.29.85.234.15
.79.65.5.97.100.109.105.110/name admin

OpenRG> conf set /snmp/mibs/usm_mib/usmuser_table/13.128.0.42.47.128.242.184.29.85.234.15
.79.65.5.97.100.109.105.110/security_name admin

OpenRG> conf set /snmp/mibs/usm_mib/usmuser_table/13.128.0.42.47.128.242.184.29.85.234.15
.79.65.5.97.100.109.105.110/public ""

OpenRG> conf set /snmp/mibs/usm_mib/usmuser_table/13.128.0.42.47.128.242.184.29.85.234.15
.79.65.5.97.100.109.105.110/auth_protocol 1.3.6.1.6.3.10.1.1.1
```

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```
OpenRG> conf set /snmp/mibs/usm_mib/usmuser_table/13.128.0.42.47.128.242.184.29.85.234.15
.79.65.5.97.100.109.105.110/priv_protocol 1.3.6.1.6.3.10.1.2.1

OpenRG> conf set /snmp/mibs/usm_mib/usmuser_table/13.128.0.42.47.128.242.184.29.85.234.15
.79.65.5.97.100.109.105.110/storage_type 3

OpenRG> conf set /snmp/mibs/usm_mib/usmuser_table/13.128.0.42.47.128.242.184.29.85.234.15
.79.65.5.97.100.109.105.110/row_status 1

OpenRG> conf set /snmp/mibs/usm_mib/usmuser_table/13.128.0.42.47.128.242.184.29.85.234.15
.79.65.5.97.100.109.105.110/clone_from 0.0

OpenRG> conf set /snmp/mibs/usm_mib/usmuser_table/13.128.0.42.47.128.242.184.29.85.234.15
.79.65.5.97.100.109.105.110/engine_id <ENGINE_ID>
```

The sub-OID 13.128.0.42.47.128.242.184.29.85.234.15.79.65 stands for the engine ID (with length of 13 octets). The decimal values of each engine ID are permanent. The sub-OID 5.97.100.109.105.110 stands for "admin" (5 octets, according to the word length). The decimal values of the user name appear as defined in the ASCII table. The <ENGINE_ID> parameter should be taken from the engine ID in the output of the following command:

```
OpenRG> conf print /snmp/persist_conf
```

Note: You should copy the engine ID without the "0x" prefix.

After the commands specified above are issued, the authentication protocol is set to `usmNoAuthProtocol` (which has OID 1.3.6.1.6.3.10.1.1.1), and the privacy protocol is set to `usmNoPrivProtocol` (which has OID 1.3.6.1.6.3.10.1.2.1).

2. Associate the user with a group. The associated group can be either a new group or an existing group. For example, to add a new group called "admin_group" and associate it with the user "admin", run the following `SNMP SET` commands from a Linux shell:

```
$ snmpset -v2c -c private <OpenRG's IP address> vacmSecurityToGroupStatus.3.5.97.100.109.105
.110 i createAndWait

$ snmpset -v2c -c private <OpenRG's IP address> vacmGroupName.3.5.97.100.109.105.110 s
admin_group

$ snmpset -v2c -c private <OpenRG's IP address> vacmSecurityToGroupStorageType.3.5.97.100
.109.105.110 i nonVolatile

$ snmpset -v2c -c private <OpenRG's IP address> vacmSecurityToGroupStatus.3.5.97.100.109.105
.110 i active
```

The sub-OID 5.97.100.109.105.110 stands for "admin" (with length of 5 octets). These commands populate `vacmSecurityToGroupTable` with a new group called "admin_group".

3. Associate between the group and its views. For example, suppose you want to associate "admin_group" with a view called "admin_view" for reading, writing and notifications, with security level of `noAuthNoPriv`. You can do this by running the following `SNMP SET` commands from a Linux shell:

```
$ snmpset -v2c -c private <OpenRG's IP address> vacmAccessStatus.11.97.100.109.105.110.95
.103.114.111.117.112.0.3.1 i createAndWait

$ snmpset -v2c -c private <OpenRG's IP address> vacmAccessContextMatch.11.97.100.109.105.110
.95.103.114.111.117.112.0.3.1 i exact
```

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```
$ snmpset -v2c -c private <OpenRG's IP address> vacmAccessReadViewName.11.97.100.109.105.110
.95.103.114.111.117.112.0.3.1 s admin_view

$ snmpset -v2c -c private <OpenRG's IP address> vacmAccessWriteViewName.11.97.100.109.105
.110.95.103.114.111.117.112.0.3.1 s admin_view

$ snmpset -v2c -c private <OpenRG's IP address> vacmAccessNotifyViewName.11.97.100.109.105
.110.95.103.114.111.117.112.0.3.1 s admin_view

$ snmpset -v2c -c private <OpenRG's IP address> vacmAccessStorageType.11.97.100.109.105.110
.95.103.114.111.117.112.0.3.1 i nonVolatile

$ snmpset -v2c -c private <OpenRG's IP address> vacmAccessStatus.11.97.100.109.105.110.95
.103.114.111.117.112.0.3.1 i active
```

The sub-OID 11.97.100.109.105.110.95.103.114.111.117.112 stands for "admin_group" (with length of 11 octets).

4. Create the needed views. For example, suppose you want to define "admin_view" as a view that includes all the 1.3 subtree. You can do this by running the following SNMP SET commands:

```
$ snmpset -v2c -c private <OpenRG's IP address> vacmViewTreeFamilyStatus.10.97.100.109.105
.110.95.118.105.101.119.2.1.3 i createAndWait

$ snmpset -v2c -c private <OpenRG's IP address> vacmViewTreeFamilyType.10.97.100.109.105.110
.95.118.105.101.119.2.1.3 i included

$ snmpset -v2c -c private <OpenRG's IP address> vacmViewTreeFamilyStorageType.10.97.100.109
.105.110.95.118.105.101.119.2.1.3 i nonVolatile

$ snmpset -v2c -c private <OpenRG's IP address> vacmViewTreeFamilyStatus.10.97.100.109.105
.110.95.118.105.101.119.2.1.3 i active
```

The sub-OID 10.97.100.109.105.110.95.118.105.101.119 stands for "admin_view".

After completing these steps, you will have an SNMPv3 user account defined in OpenRG. The following is a sample SNMPv3 query issued to OpenRG's SNMP agent:

```
$ snmpwalk -v 3 -u admin -l noAuthNoPriv 192.168.1.1
```

5.4.3 Enabling Remote Administration

It is possible to access and control OpenRG not only from within the home network, but also from the Internet. This allows you, for example, to view or change your gateway's settings while travelling. It also enables you to allow your ISP to remotely view your gateway's settings and help you troubleshoot functionality and network communication issues.

Remote access to OpenRG is blocked by default to ensure the security of your home network. However, remote access can be provided via the services described further in this section. To view and configure OpenRG's remote administration options, click the 'Remote Administration' link under the 'Management' menu item. Alternatively, click the 'Remote Administration' icon in the 'Advanced' screen. The 'Remote Administration' screen appears.

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Management
Remote Administration
Universal Plug and Play
Remote Administration
Allowing remote administration to OpenRG is a security risk.
Allow Incoming WAN Access to Web-Management
Using Primary HTTP Port (80)
Using Secondary HTTP Port (8080)
Using Primary HTTPS Port (443)
Using Secondary HTTPS Port (8443)
Allow Incoming WAN Access to the Telnet Server
Using Primary Telnet Port (23)
Using Secondary Telnet Port (8023)
Using Secure Telnet over SSL Port (992)
Diagnostic Tools
Allow Incoming WAN ICMP Echo Requests (e.g. pings and ICMP traceroute queries)
Allow Incoming WAN UDP Traceroute Queries
OK
Apply
Cancel

Figure 5.18 Remote Administration

Allow Incoming Access to Web-Management Used to allow remote access to the WBM via a browser over the selected port(s). Both the secure (HTTPS) and non-secure (HTTP) access can be enabled.

Note that if you select a port other than 80 (which browsers use by default), you will have to specify the port in OpenRG's address when trying to access it. For example, after selecting port 443, you will be able to reach OpenRG's WBM by browsing to: **https://<OpenRG's Internet IP>:443**.

Allow Incoming Access to the Telnet Server Used to allow remote access to OpenRG's Telnet server over the selected port(s).

Note: Web Management and Telnet may be used to modify settings of the firewall or disable it. The remote user may also change local IP addresses and other settings, making it difficult or impossible to access the gateway from the home network. Therefore, remote access to Telnet or Web services should only be permitted **when it is absolutely necessary**.

Allow SNMP Control and Diagnostic Requests Used to allow Simple Network Management Protocol (SNMP) requests to remotely configure and monitor OpenRG. For more information, refer to Section 5.4.2.

Diagnostic Tools Used to allow the Ping and Traceroute utilities on a remote computer to communicate with OpenRG in order to test its connectivity.

TR-069 TR-069 is a WAN management protocol intended for communication between Customer Premise Equipment (CPE) and an Auto-Configuration Server (ACS). It defines a mechanism that encompasses secure auto configuration of a CPE, and also incorporates other CPE management functions into a common framework.

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TR-064 As residential gateways offer increasingly complex services, customer premise installation and configuration increase the operators' operational costs. DSL Forum's LAN-Side DSL CPE Configuration protocol, known as TR-064, provides a zero-touch solution for automating the installation and configuration of gateways from the LAN side.

Jungo.net (Jnet) Jungo's proprietary protocol that is used for gateway management from a remote or LAN machine.

- **Enabled** Selecting this check box enables remote management of the gateway via the Jnet protocol.
- **Jungo.net ACS URL** The URL of the Jungo.net Auto-Configuration Server (CONN_MPLEX).
- **Jungo.net Home Page** The URL of the Jungo.net portal.

Additional Jnet Ports This section enables you to set gateway ports for receiving remote management commands over the Jnet and Jnet-SSL protocols.

- **Allow Jnet Commands From Remote Upgrade Server** When this check box is selected, OpenRG allows execution of CLI commands sent from the firmware upgrade server during OpenRG's connection to it (either scheduled or user-initiated). Clicking the 'Remote Upgrade Server URL' link, located under this check box, redirects you to the 'Firmware Upgrade' screen, where you can configure the upgrade settings (for more information, refer to Section 5.5.4).
- **Enable Incoming Jnet Requests to Port 7020** When this check box is selected, OpenRG listens on port 7020 (by default), waiting for CLI commands sent to it from a LAN machine over the Jnet protocol.
- **Allow Incoming WAN Access to Jnet** When this option is selected, OpenRG listens on the WAN port, waiting for CLI commands sent to it from a remote machine over the Jnet protocol.
- **Enable Incoming Jnet-SSL Requests to Port 7021** When this check box is selected, OpenRG listens on port 7021 (by default), waiting for CLI commands sent to it from a LAN machine over the Jnet protocol secured by the SSL.
- **Allow Incoming WAN Access to Jnet** When this option is selected, OpenRG listens on the WAN port, waiting for CLI commands sent to it from a remote machine over the Jnet protocol secured by the SSL.

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5.5 Performing System Maintenance

5.5.1 About OpenRG

The 'About OpenRG' screen presents various details about OpenRG's software version, such as version number, type of platform and list of features. In addition, it displays Jungo's contact information.

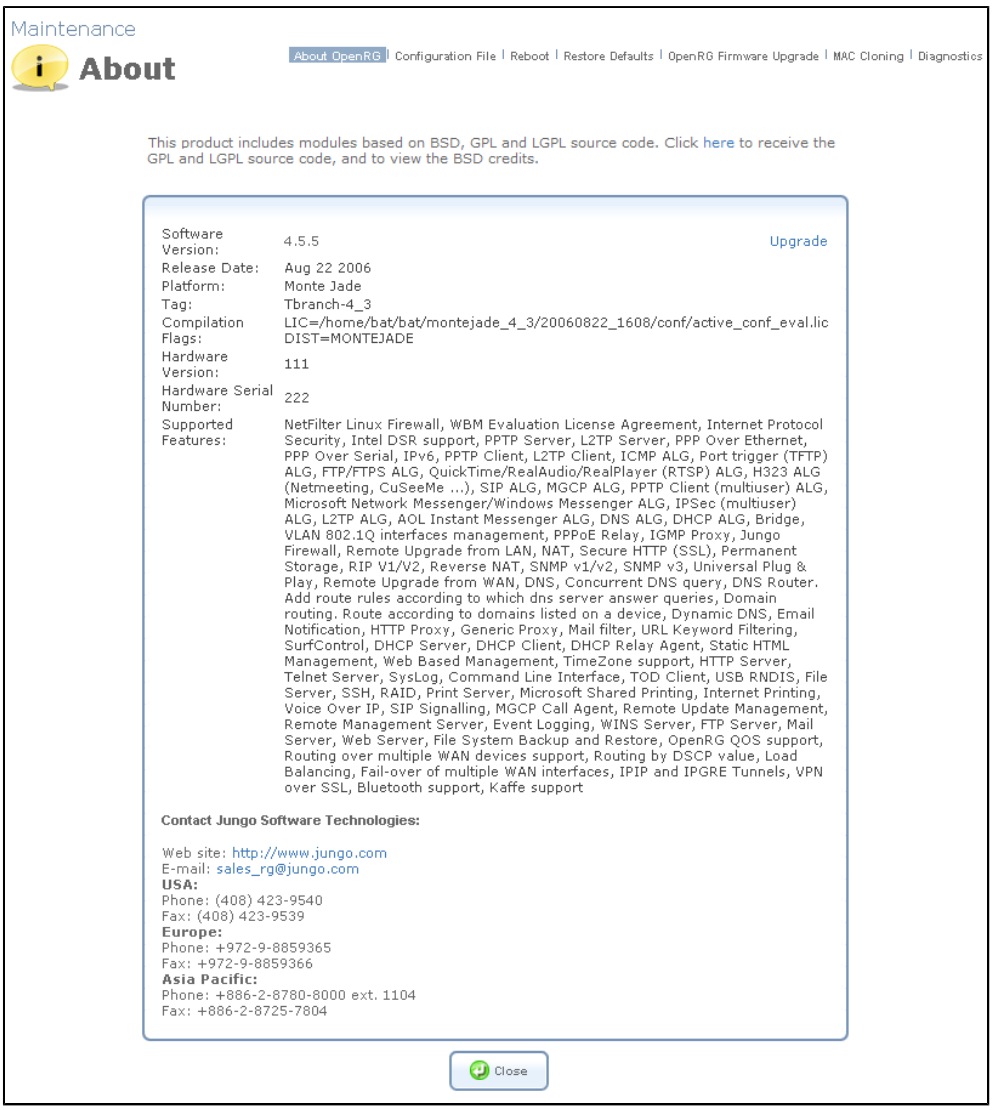
Maintenance
About
About OpenRG | Configuration File | Reboot | Restore Defaults | OpenRG Firmware Upgrade | MAC Cloning | Diagnostics
This product includes modules based on BSD, GPL and LGPL source code. Click here to receive the GPL and LGPL source code, and to view the BSD credits.
Software Version: 4.5.5 Upgrade
Release Date: Aug 22 2006
Platform: Monte Jade
Tag: Tbranch-4_3
Compilation Flags: LIC=/home/bat/bat/montejade_4_3/20060822_1608/conf/active_conf_eval.lic DIST=MONTEJADE
Hardware Version: 111
Hardware Serial Number: 222
Supported Features: NetFilter Linux Firewall, WBM Evaluation License Agreement, Internet Protocol Security, Intel DSR support, PPTP Server, L2TP Server, PPP Over Ethernet, PPP Over Serial, IPv6, PPTP Client, L2TP Client, ICMP ALG, Port trigger (TFTP) ALG, FTP/FTPS ALG, QuickTime/RealAudio/RealPlayer (RTSP) ALG, H323 ALG (Netmeeting, CuSeeMe ...), SIP ALG, MGCP ALG, PPTP Client (multiuser) ALG, Microsoft Network Messenger/Windows Messenger ALG, IPSec (multiuser) ALG, L2TP ALG, AOL Instant Messenger ALG, DNS ALG, DHCP ALG, Bridge, VLAN 802.1Q interfaces management, PPPoE Relay, IGMP Proxy, Jungo Firewall, Remote Upgrade from LAN, NAT, Secure HTTP (SSL), Permanent Storage, RIP V1/V2, Reverse NAT, SNMP v1/v2, SNMP v3, Universal Plug & Play, Remote Upgrade from WAN, DNS, Concurrent DNS query, DNS Router. Add route rules according to which dns server answer queries, Domain routing. Route according to domains listed on a device, Dynamic DNS, Email Notification, HTTP Proxy, Generic Proxy, Mail filter, URL Keyword Filtering, SurfControl, DHCP Server, DHCP Client, DHCP Relay Agent, Static HTML Management, Web Based Management, TimeZone support, HTTP Server, Telnet Server, SysLog, Command Line Interface, TOD Client, USB RNDIS, File Server, SSH, RAID, Print Server, Microsoft Shared Printing, Internet Printing, Voice Over IP, SIP Signalling, MGCP Call Agent, Remote Update Management, Remote Management Server, Event Logging, WINS Server, FTP Server, Mail Server, Web Server, File System Backup and Restore, OpenRG QOS support, Routing over multiple WAN devices support, Routing by DSCP value, Load Balancing, Fail-over of multiple WAN interfaces, IPIP and IPGRE Tunnels, VPN over SSL, Bluetooth support, Kaffe support
Contact Jungo Software Technologies:
Web site: http://www.jungo.com
E-mail: sales_rg@jungo.com
USA:
Phone: (408) 423-9540
Fax: (408) 423-9539
Europe:
Phone: +972-9-8859365
Fax: +972-9-8859366
Asia Pacific:
Phone: +886-2-8780-8000 ext. 1104
Fax: +886-2-8725-7804
Close

Figure 5.19 About OpenRG

The line at the top of the screen relates to OpenRG's GNU General Public License (GPL) compatibility, and provides a link to the licensing acknowledgement and source code offering page in Jungo's web site. For more information, refer to Chapter 7.

5.5.2 Rebooting Your Gateway

If you wish to reboot your gateway, click the 'Reboot' link under the 'Maintenance' menu item. The 'Reboot' screen appears.

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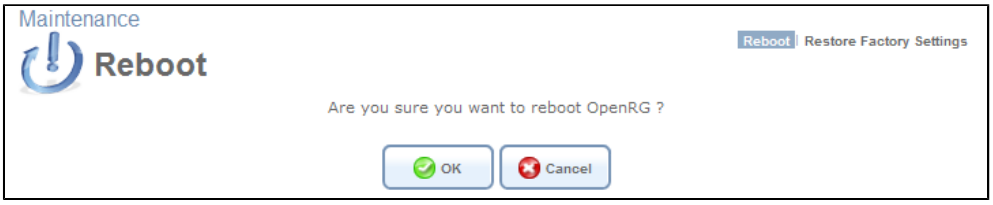

Figure 5.20 Reboot

Click 'OK' to reboot OpenRG. This may take up to one minute. To re-enter the WBM after the gateway is up, click the browser's 'Refresh' button, or browse to OpenRG's local address.

5.5.3 Restoring Factory Settings

Restoring OpenRG's factory settings removes all of the configuration changes made to OpenRG (including the created user accounts). This is useful, for example, when you wish to build your home network from the beginning, and wish to go back to the default configuration.

Click the 'Restore Factory Settings' link under the 'Maintenance' menu item. The 'Restore Factory Settings' appears.

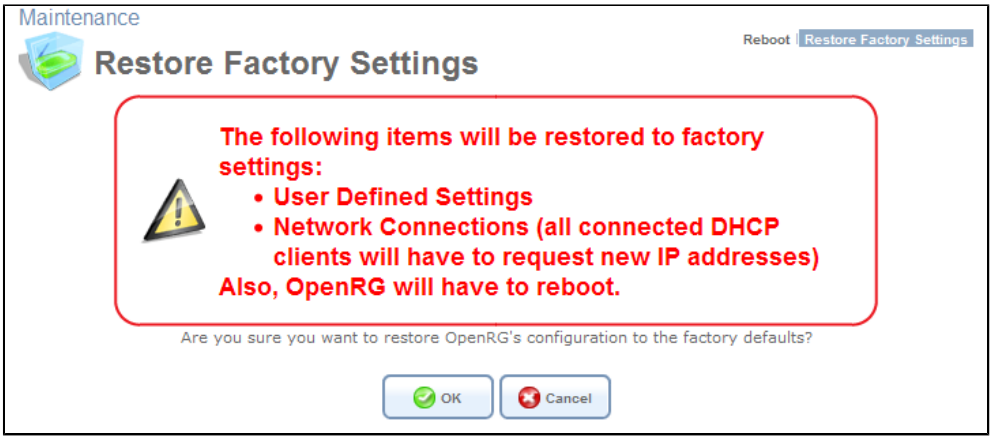
Maintenance
Restore Factory Settings
Reboot | Restore Factory Settings
The following items will be restored to factory settings:
• User Defined Settings
• Network Connections (all connected DHCP clients will have to request new IP addresses)
Also, OpenRG will have to reboot.
Are you sure you want to restore OpenRG's configuration to the factory defaults?
OK
Cancel

Figure 5.21 Restore Defaults

Click 'OK' to proceed. OpenRG removes all of your personal settings, and then reboots.

5.5.4 Upgrading the Gateway's Firmware

Click the 'OpenRG Firmware Upgrade' link in the links bar. The 'OpenRG Firmware Upgrade' screen appears.

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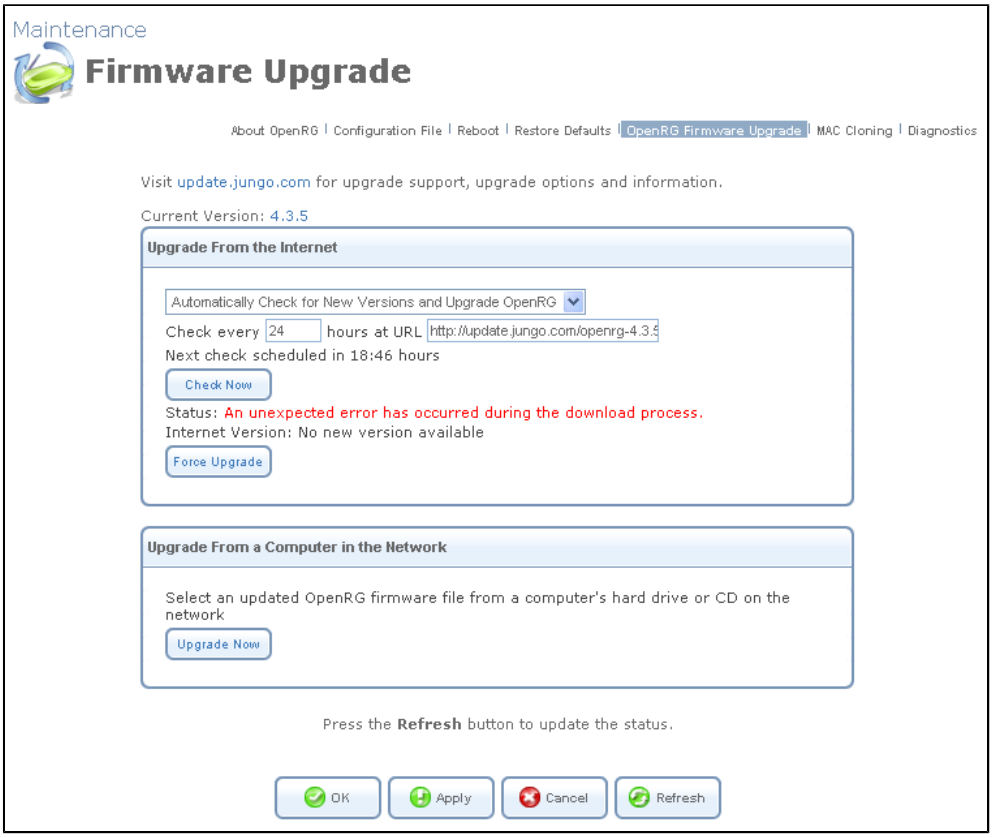
Maintenance
Firmware Upgrade
About OpenRG | Configuration File | Reboot | Restore Defaults | OpenRG Firmware Upgrade | MAC Cloning | Diagnostics
Visit update.jungo.com for upgrade support, upgrade options and information.
Current Version: 4.3.5
Upgrade From the Internet
Automatically Check for New Versions and Upgrade OpenRG
Check every 24 hours at URL http://update.jungo.com/openrg-4.3.5
Next check scheduled in 18:46 hours
Check Now
Status: An unexpected error has occurred during the download process.
Internet Version: No new version available
Force Upgrade
Upgrade From a Computer in the Network
Select an updated OpenRG firmware file from a computer's hard drive or CD on the network
Upgrade Now
Press the Refresh button to update the status.
OK
Apply
Cancel
Refresh

Figure 5.22 OpenRG Firmware Upgrade

OpenRG offers a built-in mechanism for upgrading its software image, without losing any of your custom configurations and settings. There are two methods for upgrading the software image:

- Upgrading from a local computer—use a software image file pre-downloaded to your PC's disk drive or located on the accompanying evaluation CD.
- Upgrading from the Internet—also referred to as *Remote Update*, use this method to upgrade your firmware by remotely downloading an updated software image file.

5.5.4.1 Upgrading From a Local Computer

To upgrade OpenRG's software image using a locally available **.rmt** file, perform the following:

1. In the 'Upgrade From a Computer in the Network' section, click the 'Upgrade Now' button. The 'Upgrade From a Computer in the Network' screen appears.

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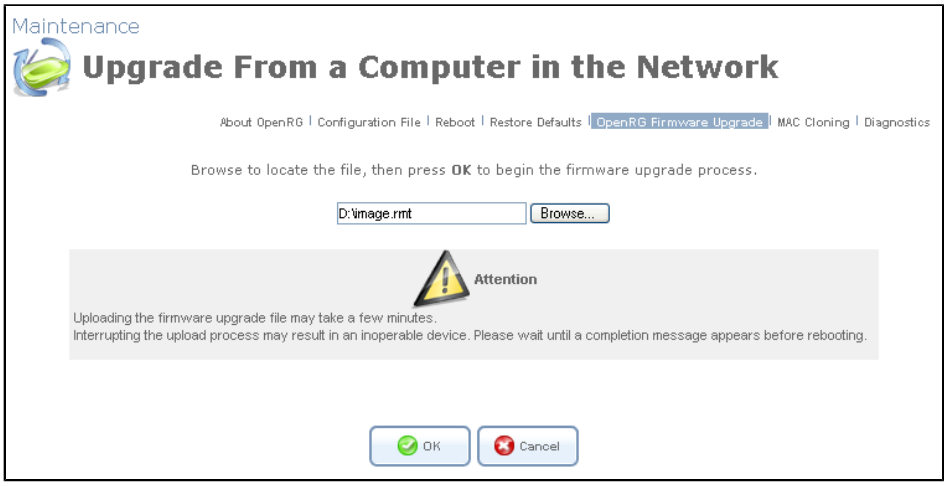
Maintenance
Upgrade From a Computer in the Network
About OpenRG | Configuration File | Reboot | Restore Defaults | OpenRG Firmware Upgrade | MAC Cloning | Diagnostics
Browse to locate the file, then press OK to begin the firmware upgrade process.
D:\image.rmt
Browse...
Attention
Uploading the firmware upgrade file may take a few minutes.
Interrupting the upload process may result in an inoperable device. Please wait until a completion message appears before rebooting.
OK
Cancel

Figure 5.23 Upgrade From a Computer in the Network

2. Enter the path of the software image file, or click the 'Browse' button to browse for the file on your PC, and click 'OK'.

> Note: You can only use files with an ' **rmt** ' extension when performing the firmware upgrade procedure.

The file will start loading from your PC to the gateway. When loading is completed, the following confirmation screen appears, asking if you would like to upgrade to the new version:

Maintenance
Firmware Upgrade
About OpenRG | Configuration File | Reboot | Restore Defaults | OpenRG Firmware Upgrade | MAC Cloning | Diagnostics
A new firmware was successfully downloaded to OpenRG
Current Version: MONTEJADE version 4.3.1
New Version: MONTEJADE version 4.3.5
Attention
Upgrading OpenRG will erase all user-defined settings.
Do you want to upgrade to the new version?
OK
Cancel

Figure 5.24 Confirm Upgrade

3. Click 'OK' to confirm. When the upgrade process ends, OpenRG automatically reboots, and the login screen of the updated image is displayed. The new software maintains your custom configurations and settings.

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5.5.4.2 Upgrading From the Internet

The **Remote Upgrade** mechanism enables you to keep your software image up-to-date, by performing routine daily [1] checks for newer software versions, as well as letting you perform manual checks.

To view the automatic check utility's settings and the last checking result, click the 'OpenRG Firmware Upgrade' icon from the 'Advanced' screen. The 'OpenRG Firmware Upgrade' screen will appear (see Figure 5.22). In the 'Upgrade From the Internet' section, you can select the utility's checking method and interval. The result of the last performed check is displayed between the 'Check Now' and 'Force Upgrade' buttons, indicating whether a new version is available or not.

- If a new version is available:

  1. Click the 'Force Upgrade' button. A download process will begin. When downloading is completed, a confirmation screen will appear (see Figure 5.24), asking whether you wish to upgrade to the new version.

  2. Click 'OK' to confirm. The upgrade process will begin and should take no longer than one minute to complete.

  At the conclusion of the upgrade process, OpenRG will automatically reboot. The new software version will run, maintaining your custom configurations and settings.

- If a new version is unavailable:

  1. Click the 'Check Now' button to perform an immediate check (instead of waiting for the next scheduled one). The screen will display a "Check in progress..." message.

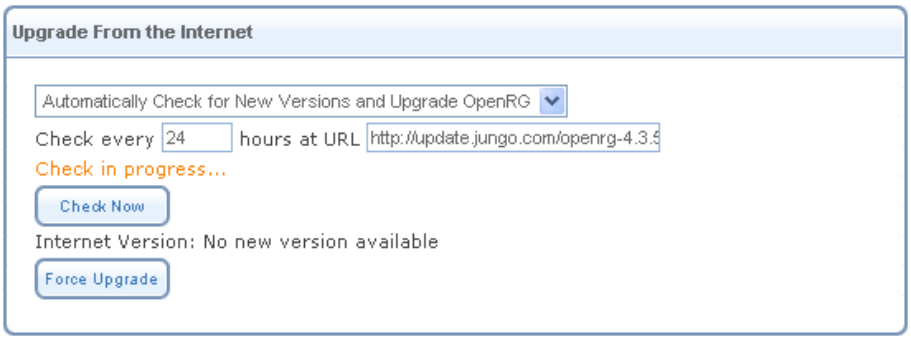
Upgrade From the Internet
Automatically Check for New Versions and Upgrade OpenRG
Check every 24 hours at URL http://update.jungo.com/openrg-4.3.5
Check in progress...
Check Now
Internet Version: No new version available
Force Upgrade

Figure 5.25 Remote Update Check

  2. Click the 'Refresh' button until the check is completed and the result is displayed.

[1] The gateway must be connected to the Internet in order to communicate with the Remote Upgrade server. Systems that store the time internally will attempt to connect and check for an update every 24 hours; systems that lack a BIOS battery will check each time the system restarts and at 24-hour intervals thereafter.

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5.5.5 Replacing OpenRG's MAC Address

Click the 'MAC Cloning' link in the links bar. The 'MAC Cloning' screen appears.

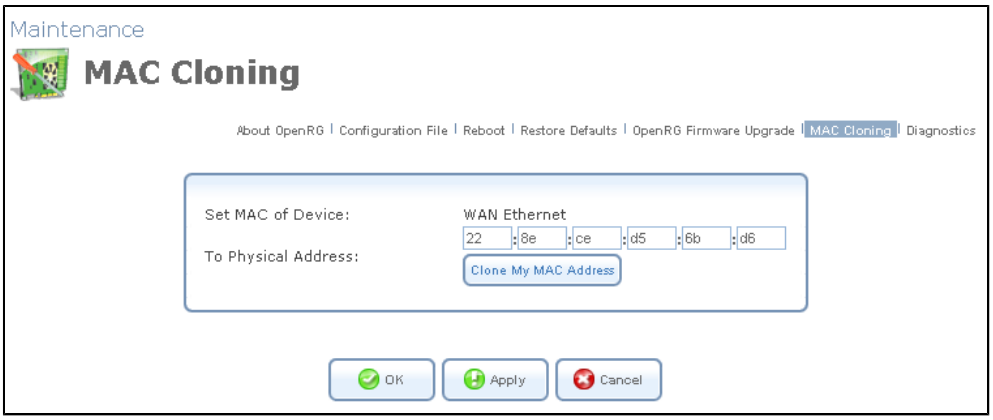
Maintenance
MAC Cloning
About OpenRG | Configuration File | Reboot | Restore Defaults | OpenRG Firmware Upgrade | MAC Cloning | Diagnostics
Set MAC of Device:
WAN Ethernet
To Physical Address:
22 : 8e : ce : d5 : 8b : d6
Clone My MAC Address
OK
Apply
Cancel

Figure 5.26 MAC Cloning Settings

A Media Access Control (MAC) address is the numeric code that identifies a device on a network, such as a modem or a PC network card. After connecting OpenRG, you can replace its MAC address with that of the modem or network card. This is useful, for example, if you are using a static IP address service provided by your ISP. The ISP uses the MAC address to identify the device to which it grants the static IP address. If OpenRG is identified by the replaced MAC address, you can continue receiving the service uninterrupted, and without having to inform your ISP of your newly installed equipment.

To override OpenRG's MAC address with that of the currenly connected modem or network card, click 'Clone My MAC Address'. The MAC address of device connected to OpenRG will replace OpenRG's original one. Click 'OK' to save the changes.

You may also replace OpenRG's MAC address manually, by typing any valid MAC address in the provided fields and clicking 'OK'.

5.6 Creating and Loading Digital Certificates

5.6.1 Overview

Public-key cryptography uses a pair of keys: a public key and a corresponding private key. These keys can play opposite roles, either encrypting or decrypting data. Your public key is made known to the world, while your private key is kept secret. The public and private keys are mathematically associated; however it is computationally infeasible to deduce the private key from the public key. Anyone who has the public key can encrypt information that can only be decrypted with the matching private key. Similarly, the person with the private key can encrypt information that can only be decrypted with the matching public key.

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Technically, both public and private keys are large numbers that work with cryptographic algorithms to produce encrypted material. The primary benefit of public-key cryptography is that it allows people who have no preexisting security arrangement to authenticate each other and exchange messages securely. OpenRG makes use of public-key cryptography to encrypt and authenticate keys for the encryption of Wireless and VPN data communication, the Web Based Management (WBM) utility, and secured telnet.

5.6.1.1 Digital Certificates

When working with public-key cryptography, you should be careful and make sure that you are using the correct person's public key. Man-in-the-middle attacks pose a potential threat, where an ill-intending 3rd party posts a phony key with the name and user ID of an intended recipient. Data transfer that is intercepted by the owner of the counterfeit key can fall in the wrong hands.

Digital certificates provide a means for establishing whether a public key truly belongs to the supposed owner. It is a digital form of credential. It has information on it that identifies you, and an authorized statement to the effect that someone else has confirmed your identity. Digital certificates are used to foil attempts by an ill-intending party to use an unauthorized public key.

A digital certificate consists of the following:

A public key An encryption key that is published and available to anyone.

Certificate information The "identity" of the user, such as name, user ID and so on.

Digital signatures A statement stating that the information enclosed in the certificate has been vouched for by a Certificate Authority (CA).

Binding this information together, a certificate is a public key with identification forms attached, coupled with a stamp of approval by a trusted party.

5.6.1.2 X.509 Certificate Format

OpenRG supports X.509 certificates that comply with the ITU-T X.509 international standard. An X.509 certificate is a collection of a standard set of fields containing information about a user or device and their corresponding public key. The X.509 standard defines what information goes into the certificate, and describes how to encode it (the data format). All X.509 certificates have the following data:

The certificate holder's public key the public key of the certificate holder, together with an algorithm identifier that specifies which cryptosystem the key belongs to and any associated key parameters.

The serial number of the certificate the entity (application or person) that created the certificate is responsible for assigning it a unique serial number to distinguish it from other certificates it issues. This information is used in numerous ways; for example when a certificate is revoked, its serial number is placed on a Certificate Revocation List (CRL).

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The certificate holder's unique identifier this name is intended to be unique across the Internet. A DN consists of multiple subsections and may look something like this: CN=John Smith, EMAIL=openrg@jungo.com, OU=R&D, O=Jungo, C=US (These refer to the subject's Common Name, Organizational Unit, Organization, and Country.)

The certificate's validity period the certificate's start date/time and expiration date/time; indicates when the certificate will expire.

The unique name of the certificate issuer the unique name of the entity that signed the certificate. This is normally a CA. Using the certificate implies trusting the entity that signed this certificate. (Note that in some cases, such as root or top-level CA certificates, the issuer signs its own certificate.)

The digital signature of the issuer the signature using the private key of the entity that issued the certificate.

The signature algorithm identifier identifies the algorithm used by the CA to sign the certificate.

5.6.2 OpenRG Certificate Stores

OpenRG maintains two certificate stores:

1. **OpenRG Local Store** This store contains a list of approved certificates that are used to identify OpenRG to its clients. The list also includes certificate requests that are pending a CA's endorsement. You can obtain certificates for OpenRG using the following methods:

   - Requesting an X509 Certificate – This method creates both a private and a matching public key. The public key is then sent to the CA to be certified.

   - Creating a Self-Signed Certificate – This method is the same as requesting a certificate, only the authentication of the public key does not require a CA. This is mainly intended for use within small organizations.

   - Loading a PKCS#12 Format Certificate – This method loads a certificate using an already available and certified set of private and public keys.

2. **Certificate Authority (CA)** Store This store contains a list of the trusted certificate authorities, which is used to check certificates presented by OpenRG clients.

5.6.2.1 Requesting an X509 Certificate

To obtain an X509 certificate, you must ask a CA to issue you one. You provide your public key, proof that you possess the corresponding private key, and some specific information about yourself. You then digitally sign the information and send the whole package (the certificate request) to the CA. The CA then performs some due diligence in verifying that the information you provided is correct and, if so, generates the certificate and returns it. You might think of an

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X509 certificate as looking like a standard paper certificate with a public key taped to it. It has your name and some information about you on it, plus the signature of the person who issued it to you.

To request an X509 certificate, perform the following:

1. Access this feature either from the 'Objects and Rules' menu item under the 'System' tab, or by clicking its icon in the 'Advanced' screen. The 'OpenRG's Local' sub-tab of the 'Certificates' screen appears.

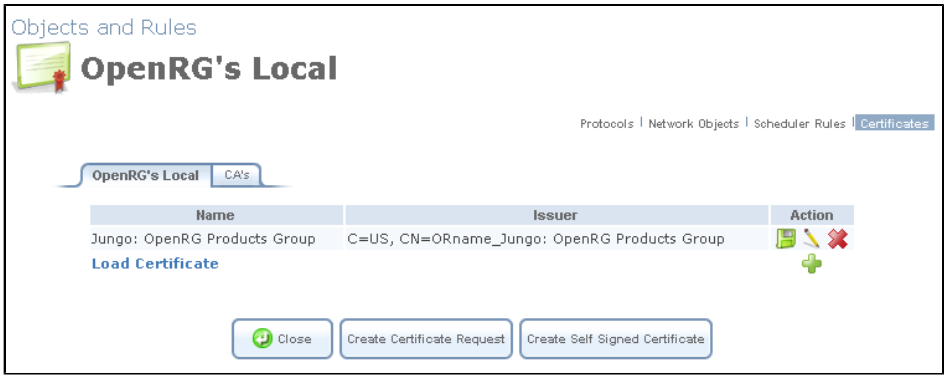

Figure 5.27 Certificate Management

2. Click the 'Create Certificate Request' button. The 'Create X509 Request' screen appears:

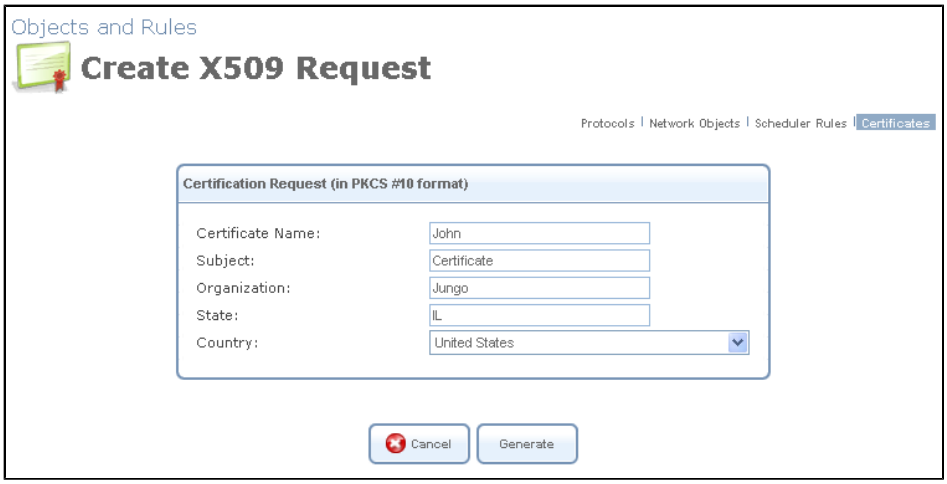

Figure 5.28 Create X509 Request

3. Enter the following certification request parameters:

   - Certificate Name
   - Subject
   - Organization
   - State
   - Country

4. Click the 'Generate' button. A screen appears, stating that the certification request is being generated.

Objects and Rules
New X509 Request
Protocols | Network Objects | Scheduler Rules | Certificates
Attention
Generating request. This can take some time. Please wait.
Press the Refresh button to update the data.
Abort
Refresh

Figure 5.29 Generating a Request

5. After a short while, click the 'Refresh' button, until the 'Download Certificate Request' screen appears.

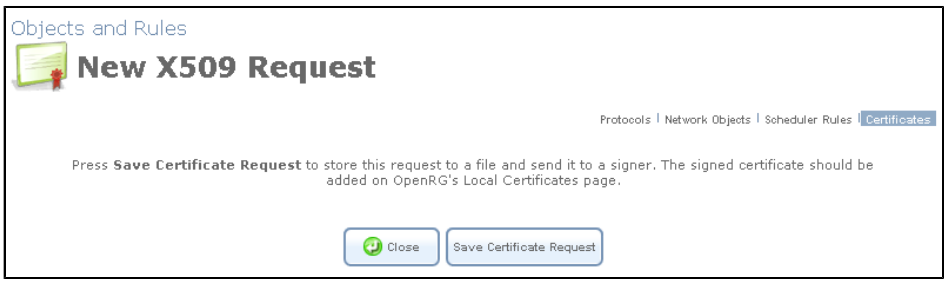
Objects and Rules
New X509 Request
Protocols | Network Objects | Scheduler Rules | Certificates
Press Save Certificate Request to store this request to a file and send it to a signer. The signed certificate should be added on OpenRG's Local Certificates page.
Close
Save Certificate Request

Figure 5.30 Save Certificate Request

6. Click the 'Download Certificate Request' button, and save the request to a file.

7. Click the 'Close' button. The main certificate management screen reappears, listing your certificate as "Unsigned". In this state, the request file may be opened at any time by clicking the action icon and then 'Open' in the dialogue box (Windows only).

Figure 5.31 Unsigned Certification Request

8. After receiving a reply from the CA in form of a '.pem' file, click the 'Upload Certificate' link. The 'Load OpenRG's Local Certificate' screen appears.

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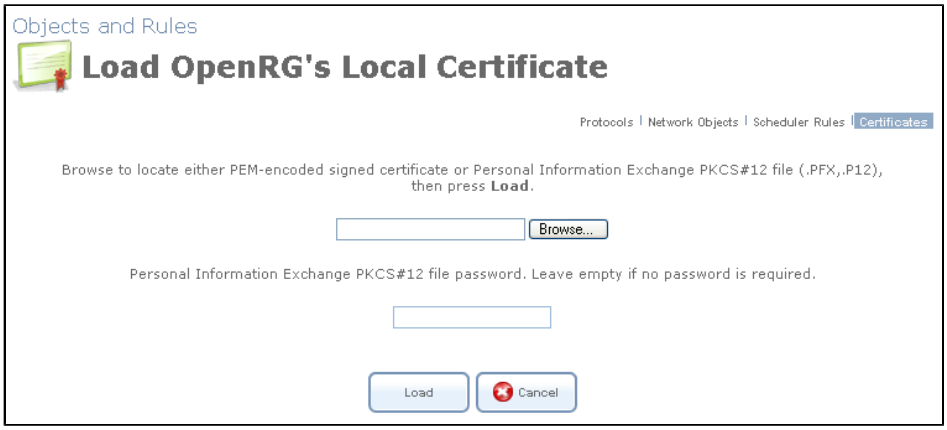
Objects and Rules
Load OpenRG's Local Certificate
Protocols | Network Objects | Scheduler Rules | Certificates
Browse to locate either PEM-encoded signed certificate or Personal Information Exchange PKCS#12 file (.PFX,.P12), then press Load.
Browse...
Personal Information Exchange PKCS#12 file password. Leave empty if no password is required.
Load
Cancel

Figure 5.32 Load Certificate

9. Click the 'Browse' button to browse to the signed certificate '.pem' file. Leave the password entry empty and click "Upload" to load the signed certificate. The certificate management screen appears, displaying the certificate name and issuer.

Figure 5.33 Loaded Certificate

10. Click the action icon and then the 'Open' button in the dialogue box to view the 'Certificate' window (Windows only).

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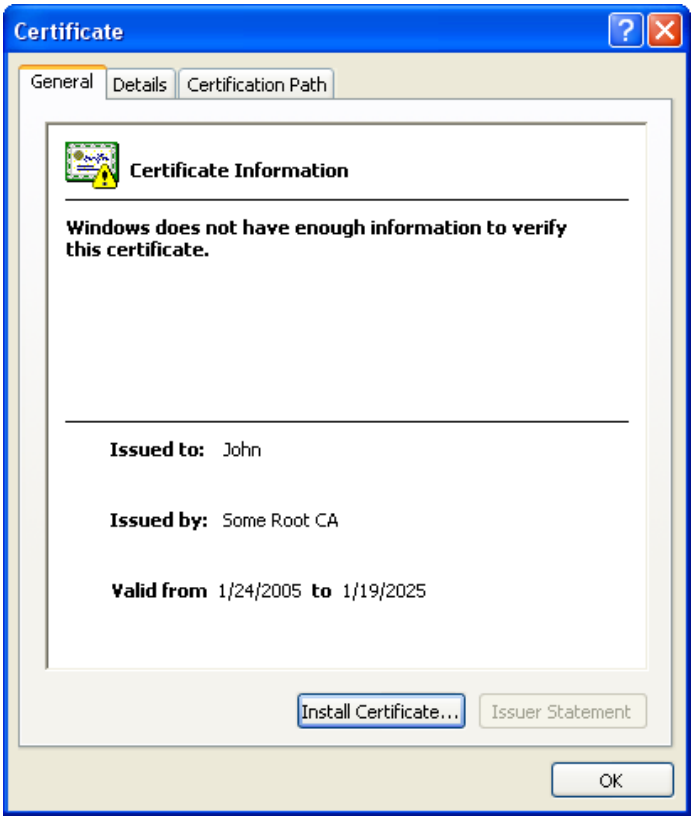

Figure 5.34 Certificate Window

Alternatively, click 'Save' in the dialogue box to save the certificate to a file.

11. You can also click the action icon to view the 'Certificate Details' screen.

Objects and Rules
Certificate Details
Protocols | Network Objects | Scheduler Rules | Certificates
Owner: OpenRG
Name: Jungo: OpenRG Products Group
Subject: C=US, CN=ORname_Jungo: OpenRG Products Group
Issuer: C=US, CN=ORname_Jungo: OpenRG Products Group
Validity Period:
Not Before: Jun 3 11:11:43 2004 GMT
Not After: May 29 11:11:43 2024 GMT
Close

Figure 5.35 Certificate Details

5.6.2.2 Creating a Self-Signed Certificate

A default self-signed certificate is included in OpenRG, in order to enable certificate demanding services such as HTTPS.

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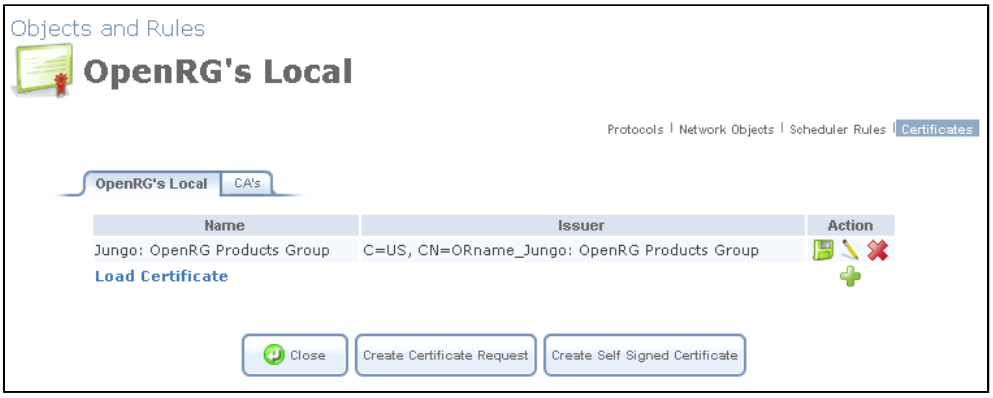

Figure 5.36 Certificates

Note that if deleted, this certificate is restored when OpenRG's Restore Defaults operation is run (refer to Section 5.5.3).

To create a self-signed certificate, perform the following:

1. In the 'OpenRG's Local' sub-tab of the 'Certificates' screen, click the 'Create Self Signed Certificate' button. The 'Create Self Signed X509 Certificate' screen appears.

Figure 5.37 Create Self Signed X509 Certificate

2. Enter the following certification request parameters:
   - Certificate Name
   - Subject
   - Organization
   - State
   - Country
3. Click the 'Generate' button. A screen appears, stating that the certificate is being generated (see Figure 5.38).

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Objects and Rules
New Self Signed X509 Certificate
Protocols | Network Objects | Scheduler Rules | Certificates
Attention
Generating certificate. This can take some time. Please wait.
Press the Refresh button to update the data.
Abort
Refresh

Figure 5.38 Generating a Self-Signed X509 Certificate

4. After a short while, click the 'Refresh' button, until the 'Certificate Details' screen appears.

Objects and Rules
Certificate Details
Protocols | Network Objects | Scheduler Rules | Certificates
Owner: OpenRG
Name: Smith
Subject: CN=Self-certificate, O=Jungo, ST=IL, C=US, CN=Smith
Issuer: CN=Self-certificate, O=Jungo, ST=IL, C=US, CN=Smith
Validity Period:
Not Before: Sep 11 16:38:12 2006 GMT
Not After: Sep 6 16:38:12 2026 GMT
Close

Figure 5.39 Certificate Details

5. Click the 'Close' button. The main certificate management screen reappears, displaying the certificate name and issuer (see Figure 5.40).

Figure 5.40 Loaded Certificate

6. Click the action icon and then the 'Open' button in the dialogue box to view the 'Certificate' window (Windows only).

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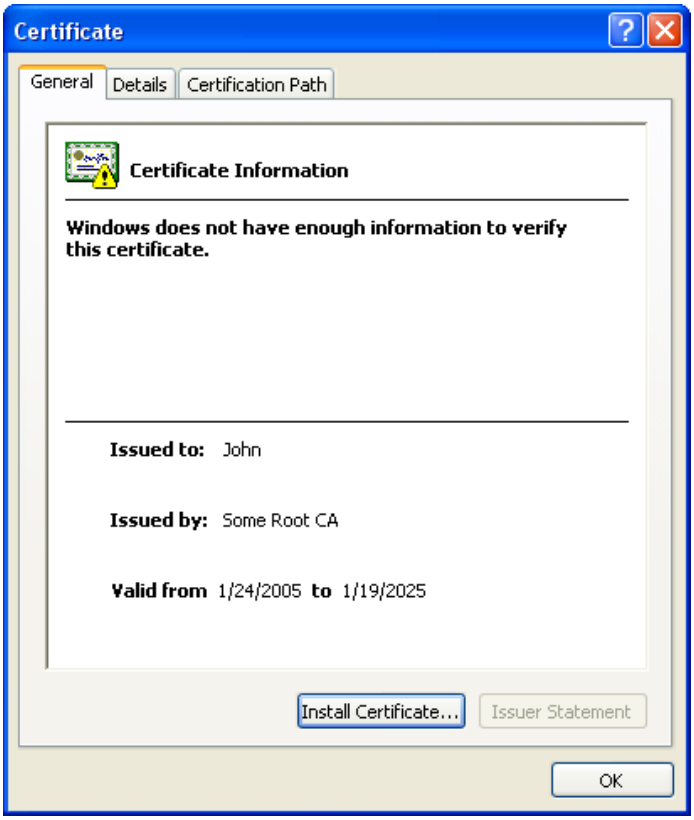

Figure 5.41 Certificate Window

Alternatively, click 'Save' in the dialogue box to save the certificate to a file.

7. You can also click the action icon to view the 'Certificate Details' screen.

Objects and Rules
Certificate Details
Protocols | Network Objects | Scheduler Rules | Certificates
Owner: OpenRG
Name: Jungo: OpenRG Products Group
Subject: C=US, CN=ORname_Jungo: OpenRG Products Group
Issuer: C=US, CN=ORname_Jungo: OpenRG Products Group
Validity Period:
Not Before: Jun 3 11:11:43 2004 GMT
Not After: May 29 11:11:43 2024 GMT
Close

Figure 5.42 Certificate Details

5.6.2.3 Loading a PKCS#12 Format Certificate

You can load certificates in PKCS#12 format (usually stored in .p12 files) to OpenRG's certificate store. To do so, you must first obtain the '.p12' file, containing the private and public keys and optional CA certificates. Then, perform the following:

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1. In the 'OpenRG's Local' sub-tab of the 'Certificates' screen, click the 'Upload Certificate' link. The 'Load OpenRG's Local Certificate' screen appears.

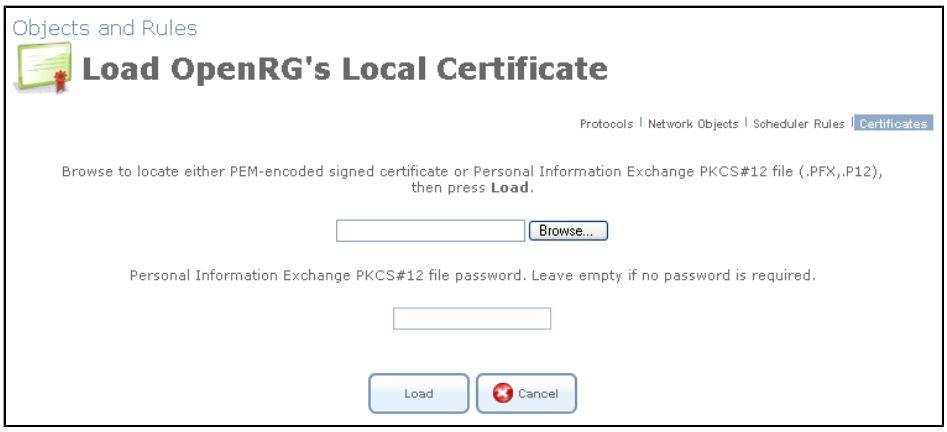
Objects and Rules
Load OpenRG's Local Certificate
Protocols | Network Objects | Scheduler Rules | Certificates
Browse to locate either PEM-encoded signed certificate or Personal Information Exchange PKCS#12 file (.PFX,.P12), then press Load.
Browse...
Personal Information Exchange PKCS#12 file password. Leave empty if no password is required.
Load
Cancel

Figure 5.43 Load Certificate

2. Click the 'Browse' button to browse to the '.p12' file. If the private key is encrypted using a password, type it in the password entry (otherwise leave the entry empty), and click "Upload" to load the certificate. The certificate management screen appears, displaying the certificate name and issuer.

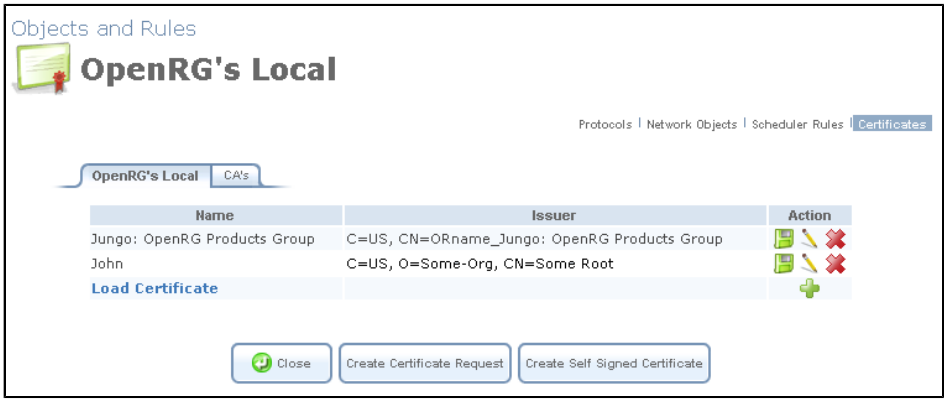

Figure 5.44 Loaded Certificate

If the '.p12' file contained any CA certificates, they will be displayed in the CA store (click the 'CA's' tab to view the CA certificates).

3. Click the action icon and then the 'Open' button in the dialogue box to view the 'Certificate' window (Windows only).

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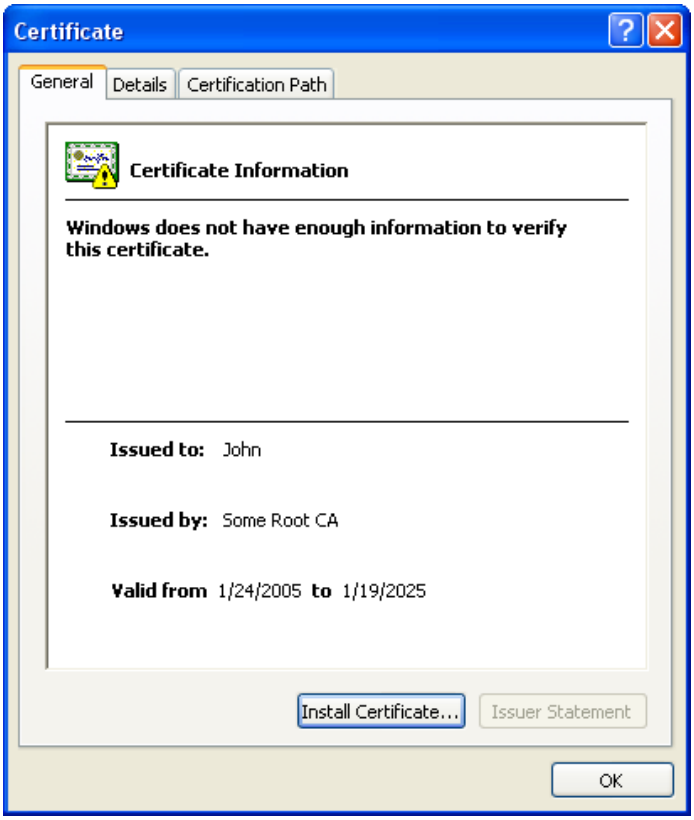

Figure 5.45 Certificate Window

Alternatively, click 'Save' in the dialogue box to save the certificate to a file.

4. You can also click the action icon to view the 'Certificate Details' screen.

Objects and Rules
Certificate Details
Protocols | Network Objects | Scheduler Rules | Certificates
Owner: OpenRG
Name: Jungo: OpenRG Products Group
Subject: C=US, CN=ORname_Jungo: OpenRG Products Group
Issuer: C=US, CN=ORname_Jungo: OpenRG Products Group
Validity Period:
Not Before: Jun 3 11:11:43 2004 GMT
Not After: May 29 11:11:43 2024 GMT
Close

Figure 5.46 Certificate Details

5.6.2.4 Loading a CA's Certificate

Before you can load a CA's certificate, you must obtain a signed certificate '.pem' or '.p12' file. Then, perform the following:

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1. In the 'Certificates' screen, click the 'CA's' sub-tab. The 'CA's' screen appears, displaying a list of certificates.

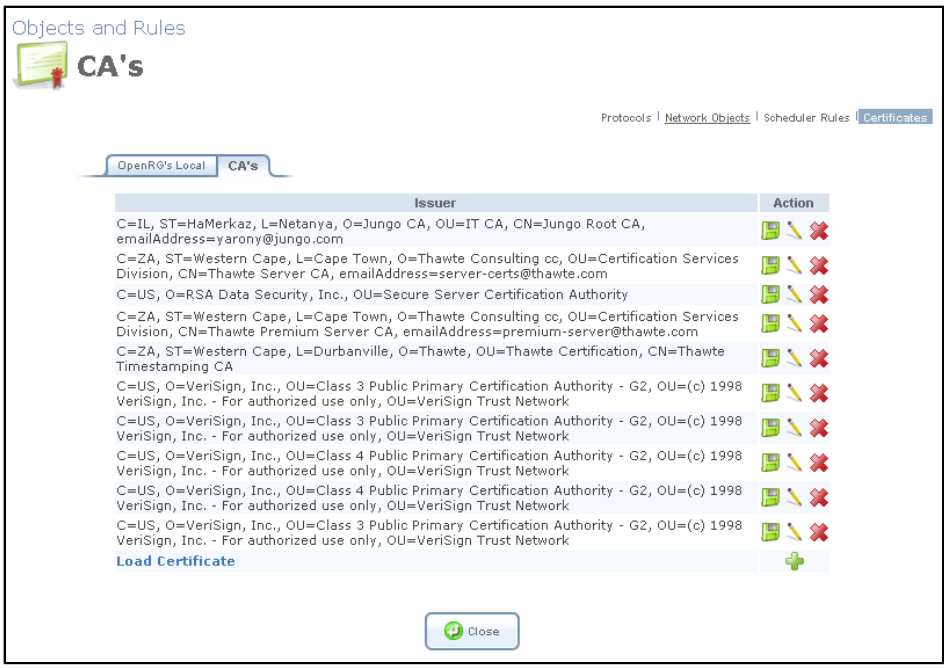
Objects and Rules
CA's
Protocols | Network Objects | Scheduler Rules | Certificates
OpenRG's Local
CA's
Issuer
Action
C=IL, ST=HaMerkaz, L=Netanya, O=Jungo CA, OU=IT CA, CN=Jungo Root CA, emailAddress=yarony@jungo.com
C=ZA, ST=Western Cape, L=Cape Town, O=Thawte Consulting cc, OU=Certification Services Division, CN=Thawte Server CA, emailAddress=server-certs@thawte.com
C=US, O=RSA Data Security, Inc., OU=Secure Server Certification Authority
C=ZA, ST=Western Cape, L=Cape Town, O=Thawte Consulting cc, OU=Certification Services Division, CN=Thawte Premium Server CA, emailAddress=premium-server@thawte.com
C=ZA, ST=Western Cape, L=Durbanville, O=Thawte, OU=Thawte Certification, CN=Thawte Timestamping CA
C=US, O=VeriSign, Inc., OU=Class 3 Public Primary Certification Authority - G2, OU=(c) 1998 VeriSign, Inc. - For authorized use only, OU=VeriSign Trust Network
C=US, O=VeriSign, Inc., OU=Class 3 Public Primary Certification Authority - G2, OU=(c) 1998 VeriSign, Inc. - For authorized use only, OU=VeriSign Trust Network
C=US, O=VeriSign, Inc., OU=Class 4 Public Primary Certification Authority - G2, OU=(c) 1998 VeriSign, Inc. - For authorized use only, OU=VeriSign Trust Network
C=US, O=VeriSign, Inc., OU=Class 4 Public Primary Certification Authority - G2, OU=(c) 1998 VeriSign, Inc. - For authorized use only, OU=VeriSign Trust Network
C=US, O=VeriSign, Inc., OU=Class 3 Public Primary Certification Authority - G2, OU=(c) 1998 VeriSign, Inc. - For authorized use only, OU=VeriSign Trust Network
Load Certificate
Close

Figure 5.47 CA's Certificates

2. Click the 'Upload Certificate' link. The 'Load CA's Certificate' screen appears.

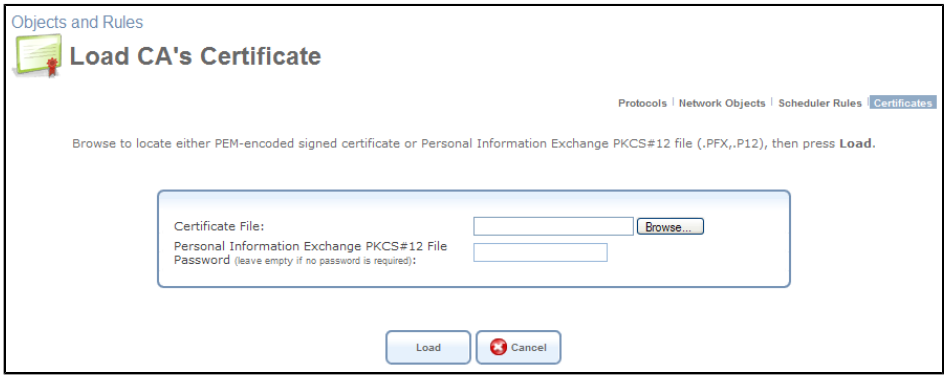
Objects and Rules
Load CA's Certificate
Protocols | Network Objects | Scheduler Rules | Certificates
Browse to locate either PEM-encoded signed certificate or Personal Information Exchange PKCS#12 file (.PFX,.P12), then press Load.
Certificate File:
Browse...
Personal Information Exchange PKCS#12 File Password (leave empty if no password is required):
Load
Cancel

Figure 5.48 Load CA's Certificate

3. Click the 'Browse' button to browse to the '.pem' or '.p12' file. Leave the password entry empty and click "Upload" to load the certificate. The CA Certificates screen reappears (see Figure 5.47), displaying the trusted certificate authority at the bottom of the list.

4. Click the action icon and then the 'Open' button in the dialogue box to view the 'Certificate' window (Windows only).

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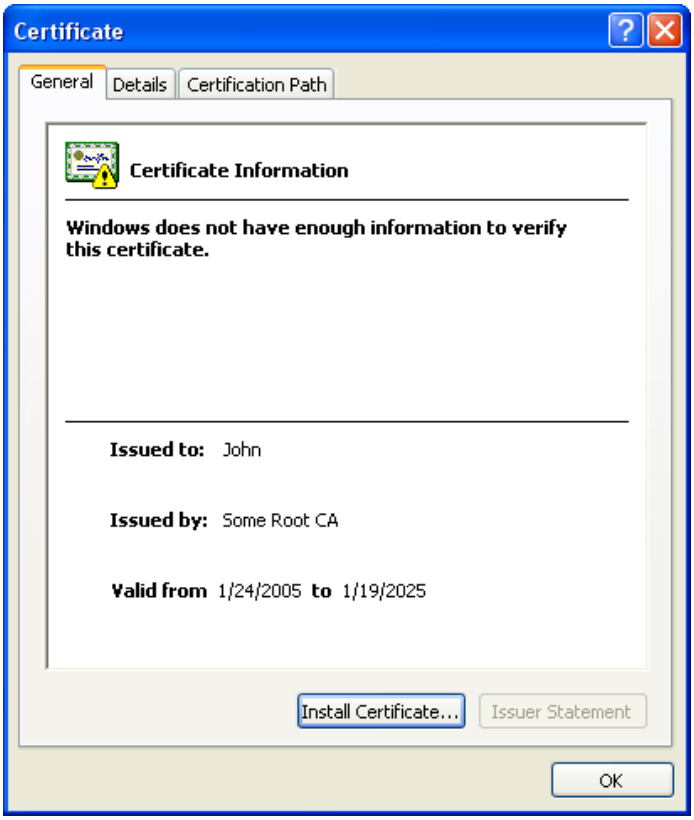

Figure 5.49 Certificate Window

Alternatively, click 'Save' in the dialogue box to save the certificate to a file.

5. You can also click the action icon to view the 'Certificate Details' screen.

Objects and Rules
Certificate Details
Protocols | Network Objects | Scheduler Rules | Certificates
Owner: OpenRG
Name: Jungo: OpenRG Products Group
Subject: C=US, CN=ORname_Jungo: OpenRG Products Group
Issuer: C=US, CN=ORname_Jungo: OpenRG Products Group
Validity Period:
Not Before: Jun 3 11:11:43 2004 GMT
Not After: May 29 11:11:43 2024 GMT
Close

Figure 5.50 Certificate Details

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Part II Appendix

Table of Contents

6. Configuring a Computer's Network Interface 298
7. Licensing Acknowledgement and Source Code Offering 300
8. Contact Jungo 301

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6

Configuring a Computer's Network Interface

In most cases, a computer's network interface is configured by default to automatically obtain an IP address. However, a computer with a statically defined IP address and DNS address, for example, may fail to connect to OpenRG. In this case, configure the computer's network interface to obtain its IP and DNS server IP settings automatically. The configuration principle is identical but performed differently on different operating systems. Following are TCP/IP configuration instructions for all supported operating systems.

- **Windows XP**

  1. Access 'Network Connections' from the Control Panel.
  2. Right-click the Ethernet connection icon, and select 'Properties'.
  3. Under the 'General' tab, select the 'Internet Protocol (TCP/IP)' component, and press the 'Properties' button.
  4. The 'Internet Protocol (TCP/IP)' properties window will be displayed.
     a. Select the 'Obtain an IP address automatically' radio button.
     b. Select the 'Obtain DNS server address automatically' radio button.
     c. Click 'OK' to save the settings.

- **Windows 2000/98/Me**

  1. Access 'Network and Dialing Connections' from the Control Panel.

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2. Right-click the Ethernet connection icon, and select 'Properties' to display the connection's properties.

3. Select the 'Internet Protocol (TCP/IP)' component, and press the 'Properties' button. The 'Internet Protocol (TCP/IP)' properties will be displayed.

    a. Select the 'Obtain an IP address automatically' radio button.

    b. Select the 'Obtain DNS server address automatically' radio button.

    c. Click 'OK' to save the settings.

- **Linux**

1. Login into the system as a super-user, by entering "su" at the prompt.

2. Type "ifconfig" to display the network devices and allocated IP addresses.

3. Type "pump -i <dev>", where <dev> is the network device name.

4. Type "ifconfig" again to view the new allocated IP address.

5. Make sure no firewall is active on device <dev>.

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7

Licensing Acknowledgement and Source Code Offering

The OpenRG/OpenSMB product may contain code that is subject to the GNU General Public License (GPL), GNU Lesser General Public License (LGPL), and BSD (BSDS) license. The OpenRG/OpenSMB Open Source and GNU Public Licenses page contains:

- With respect to GPL/LGPL: the code package names, license types and locations for the license files, and
- With respect to BSD (BSDS): the code package names with the license texts.

To receive the source code of the GPL/LGPL packages, refer to http://www.jungo.com/openrg/download_gpl.html.

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8

Contact Jungo

For additional support, please contact Jungo Software Technologies Ltd.:

Web site:	http://www.jungo.com
E-mail:	Sales: openrg@jungo.com
	Support: rg_support@jungo.com

Jungo Headquarters
3031 Tisch Way
San Jose, CA 95128
U.S.A
Tel. +1 (408) 423 9540
+1 (877) 514 0537
Fax. +1 (877) 514 0538

EMEA
One Heathrow Blvd.
286 Bath Road
West Drayton
Middlesex UB7 0DQ
United Kingdom
Tel. +44 (20) 8476 8481
Fax. +44 (20) 8476 8482

Asia Pacific
P.O.Box 118-757 Taipei
Taipei City 10599
Taiwan (R.O.C)
Tel. +886 (9) 1938 2709

R&D Center
1 Hamachshev Street
Netanya 42504
Israel
Tel. +972 (74) 721 2121
Fax. +972 (74) 721 2122

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